

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard	1	2	3	4
A01 = Structure of microcard			SIS	
B01 = Trouble-shooting chart	-A-***X*	X*XXX	XXXXX	XXXXX *XXXX X
	-B-*XXXX	XXXXX	XXXXX	XXXXX XXX
	-C-XXXXX	XXXXX	XXXXX	XXXXX XXX
	-D-XXXXX	XXXXX	XXXXX	XXXXX XXX
	-E-XXXXX	XXXXX	XXXXX	XXXXX XX
	-F-XXXXX	XXXXX	XXXXX	XXX
	-G-XXXXX	XXXXX	XXXX	
	-H-			
	-J-			
	-K-			
	-L-			
	-M-			
N01 = Service information	-N-*XXXX	XXXXX	XXXXX XXX	*X XX*
	12345	67890	12345 67890	12345 678
		1	2	
			Index	

N28 = Table of contents and publication information


- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		
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HOW TO USE THIS MICROCARD

Trouble-shooting instructions for system: Motronic ML 4.1

Descriptions, photographs, terminal designations and special features refer to the following vehicles:

- * ALFA ROMEO 164 3.0 V6 09.87 ->
Engine: 3 l / 6 cyl.
- and
- * ALFA ROMEO 75 Twin Spark S (with catalytic converter)
Introduced in West Germany 01.88 ->
Engine: 2 l / 4 cyl.

These basic instructions are comprehensive trouble-shooting instructions. They must not be used as vehicle-specific instructions. Caution! Descriptions and photographs may deviate from the vehicle-specific brief instructions.

Mandatory set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only. For brief instructions, see table of contents Microcard KFZ-00..

A02		
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SPECIAL FEATURES

- * Motronic system ML 4.1 with self-diagnosis and flashing-code output:

Note:

In the new Alpha models, the self-diagnosis feature of this ML 4.1 system was expanded to include so-called actuator diagnosis.

Actuator diagnosis makes for active testing of several outputs of the Motronic control unit and the Motronic components connected to it including the connecting cables.

The following Motronic components can be activated (periodically with engine stopped):

1. Injection valves
 2. Idle actuator
 3. Tank ventilation valve (only catalytic-converter vehicles with closed tank ventilation and active-carbon container).
 4. Relay for camshaft switching (2 l engines only)
- * Fault lamp ("CARB lamp") in instrument panel of US models.
 - * Joint sensor for engine speed and reference mark.
 - * Single-winding rotary actuator
 - * Adaptive lambda closed-loop control on catalytic-converter vehicles
 - * Tank-ventilation switching valve in catalytic-converter vehicles (not from Bosch)

SPECIAL FEATURES (continued)

Variant encoding for the Motronic ML 4.1:

Corresponding encoding is provided by way of the Motronic wiring harness, so as to reduce the number of different types of control unit when adapting engines to various fuel grades, to operation with/without a catalytic converter and to different bodywork and types of transmission.

Several ignition maps, lambda maps and other maps are programmed in one type of control unit. The desired maps are addressed with the encoding.

Map adaptation is effected by way of various control-unit terminals. These terminals are as follows: 10, 11, 27.

Terminals 10 and 27 are of significance for after-sales service, since it is possible to use these two terminals to adapt the system to various fuel grades and/or to closed-loop operation with a catalytic converter (supplementary equipment).

The so-called bodywork or transmission variant is coded at the factory via terminal (fixed wiring in control-unit plug).

Note:

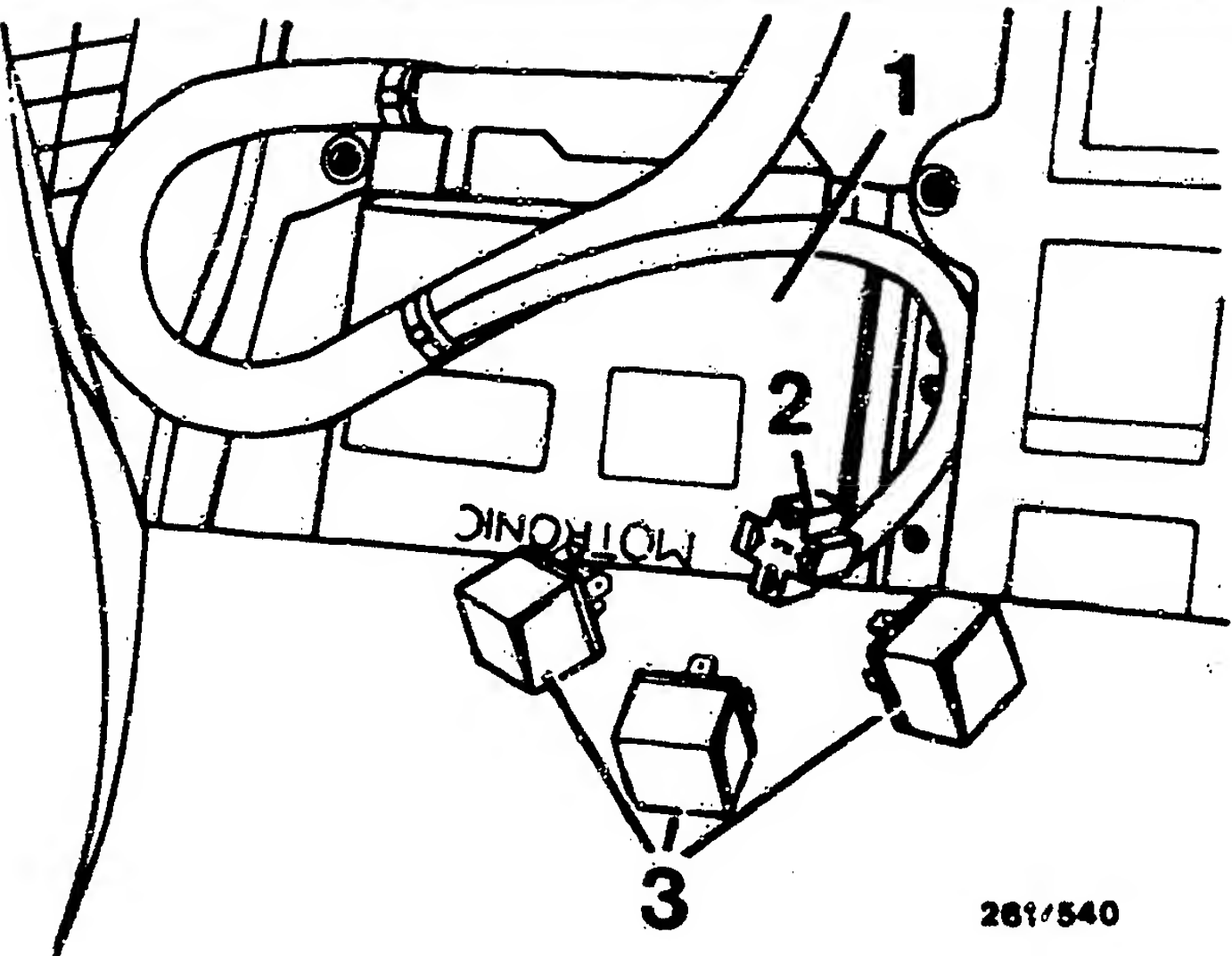
Fuel with too low an octane number causes ignition knocking. Particular attention is therefore to be paid to correct encoding (required octane number) before using such fuel. Fuel with a higher octane number can be employed.

SPECIAL FEATURES (continued)

Variant-encoding table:

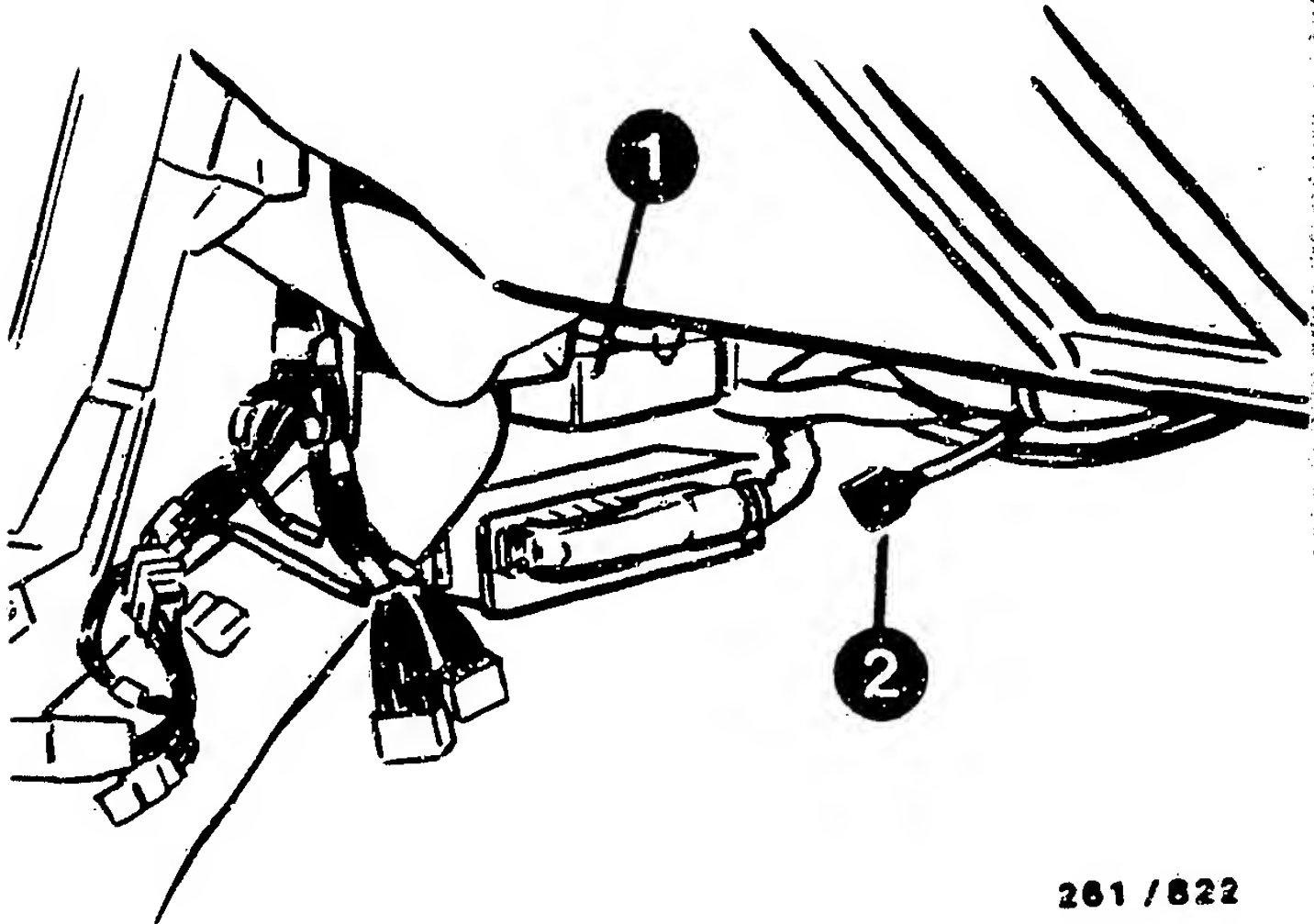
For coding terminals 10 and 27, Alfa Romeo makes use of three different-colored mini-relay housings with internally soldered jumpers corresponding to the encoding.
The encoding point is a relay frame at the Motronic wiring harness in the vicinity of the control unit.
Note: The relay frame is open with 98 RON variants.

- - _ Fuel	Premium leaded (98 RON)	Premium unleaded (95 RON)	Regular unleaded (91 RON)
Vehicle/ - - encod. section -			
Alfa 75 Twin Spark	Term. 10 open (Term. 11 open) Term. 27 open	Term. 10 to grd. (Term. 11 open) Term. 27 open	
Encoding section	None	Red	
Alfa 75 Twin Spark S (with cat.)		Term. 10 open (Term. 11 open) Term. 27 to grd.	Term. 10 to grd. (Term. 11 open) Term. 27 to grd.
Encoding section		Yellow	Blue
Alfa 164 T, Spark (2 l)	Term. 10 open (T. 11 to grd.) Term. 27 open	Term. 10 to grd. (T. 11 to grd.) Term. 27 open	
Encoding section	None	Red	
Alfa 164 T, Spark (2 l) with cat. conv.		Term. 10 open (T. 11 to grd.) Term. 27 to grd.	Term. 10 to grd. (T. 11 to grd.) Term. 27 to grd.
Encoding section		Yellow	Blue
Alfa 164 3.0 V6	Term. 10 open (T. 11 to grd.) Term. 27 open	Term. 10 to grd. (T. 11 to grd.) Term. 27 open	
Encoding section	None	Red	
Alfa 164 3.0 V6 with catalytic converter		Term. 10 open (T. 11 to grd.) Term. 27 to grd.	Term. 10 to grd. (T. 11 to grd.) Term. 27 to grd.
Encoding section		Yellow	Blue
Alfa 164 3.0 V6 Automatic	Term. 10 open (Term. 11 open) Term. 27 open	Term. 10 to grd. (Term. 11 open) Term. 27 open	
Encoding section	None	Red	
Alfa 164 3.0 V6 Automatic with cat. conv.		Term. 10 open (Term. 11 open) Term. 27 to grd.	Term. 10 to grd. (Term. 11 open) Term. 27 to grd.
Encoding section		Yellow	Blue



Alfa 75 Twin Spark S
1 = Motronic control unit
2 = Relay frame at Motronic wiring harness
3 = Encoding sections (different-colored mini-relay housings)

Alfa 164 3.0 V6
1 = Motronic control unit
2 = Relay frame at Motronic-wiring harness



SPECIAL FEATURES (continued)

Tank ventilation system:

Lambda-controlled vehicles are equipped with a closed tank ventilation system.

The fuel vapors in the fuel tank are stored in the active-carbon container.

During engine operation, the fuel vapors are drawn off by the engine via the scavenging line and a valve, the so-called tank-ventilation switching valve.

This valve is installed between active-carbon container and intake manifold and is switched by the control unit.

Tank-ventilation switching valve:

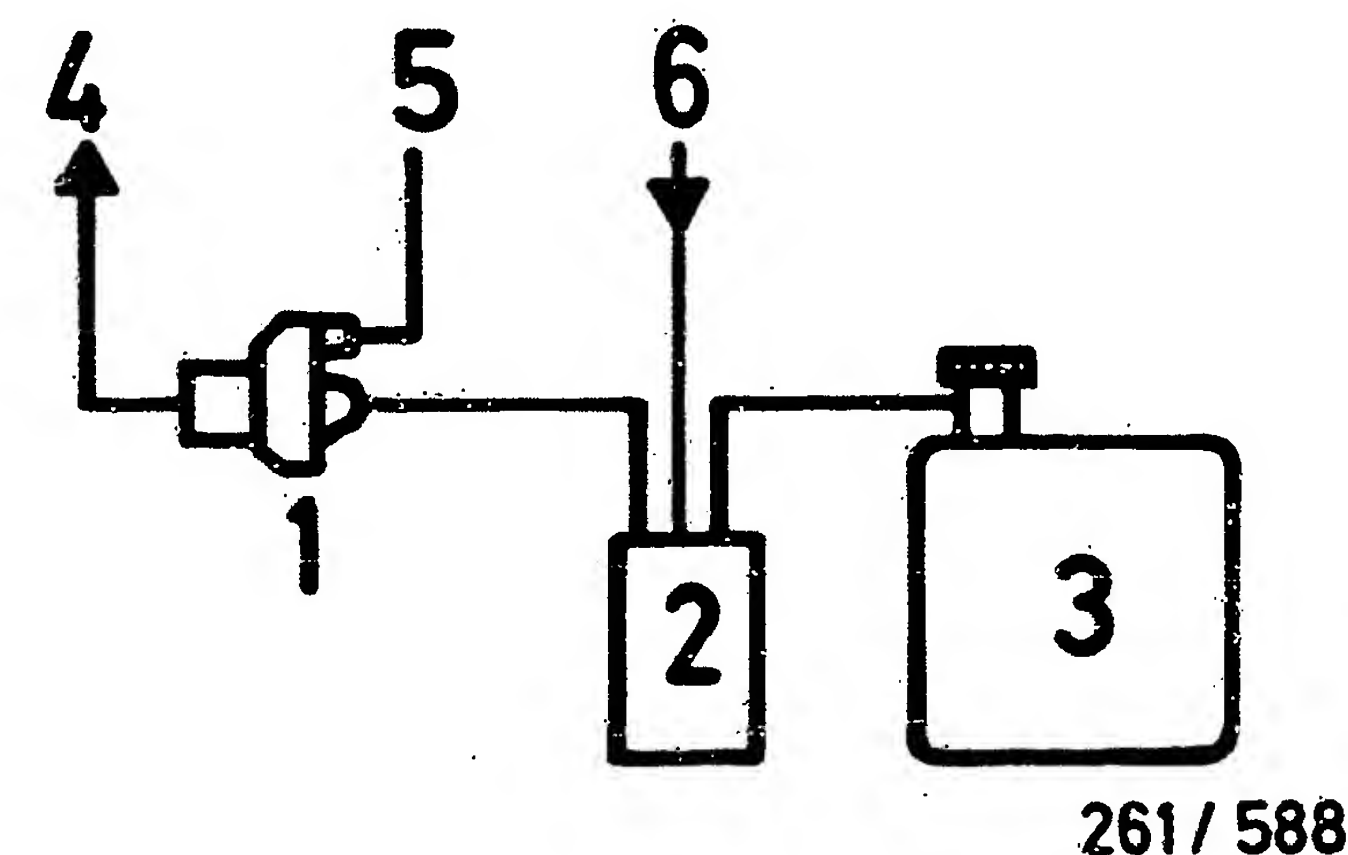
The task of the tank-ventilation switching valve is to supply the fuel vapors stored in the active-carbon container to the combustion chamber after starting.

The fuel vapors released are routed through the tank ventilation line into the active-carbon container where they enter the active-carbon fill.

The electromagnetic tank-ventilation switching valve, which opens up the scavenging line to the engine, is actuated by the Motronic control unit as a function of the operating status of the engine.

The tank-ventilation switching valve seals off the scavenging line when the ignition is switched off (no current), when the engine is cold (coolant temperature less than 60°C) and when the engine is idling with the idle contact closed.

The valve opens in the part-load range above programmed operating points. The carbon fill is then purified by way of a bleeder line at the active-carbon container.



- 1 = Tank-ventilation valve
- 2 = Activated-carbon filter
- 3 = Fuel tank
- 4 = To intake manifold
- 5 = Electrical connection
- 6 = Air supply

SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

For compression test, detach main relay in order to prevent undesirable injection by injection valves and high-voltage flashovers.

Do not short-circuit ignition coil term.1 to ground (e.g. for stopping the engine). Ignition coil and possibly control unit shall be destroyed.

Never connect positive terminal of battery to ignition coil term.1. Control unit shall be destroyed.

When fitting an alarm system, following directions of installation instructions for Motronic vehicles or SIS microcard PKW 012. Ensure that the alarm relay is not disturbed by external fields (e.g. ignition cables) and therefore responds incorrectly.

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Never start engine without battery securely connected (battery terminals tightened). Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.

Provide starting assistance only with second 12 V battery and jump leads.

Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

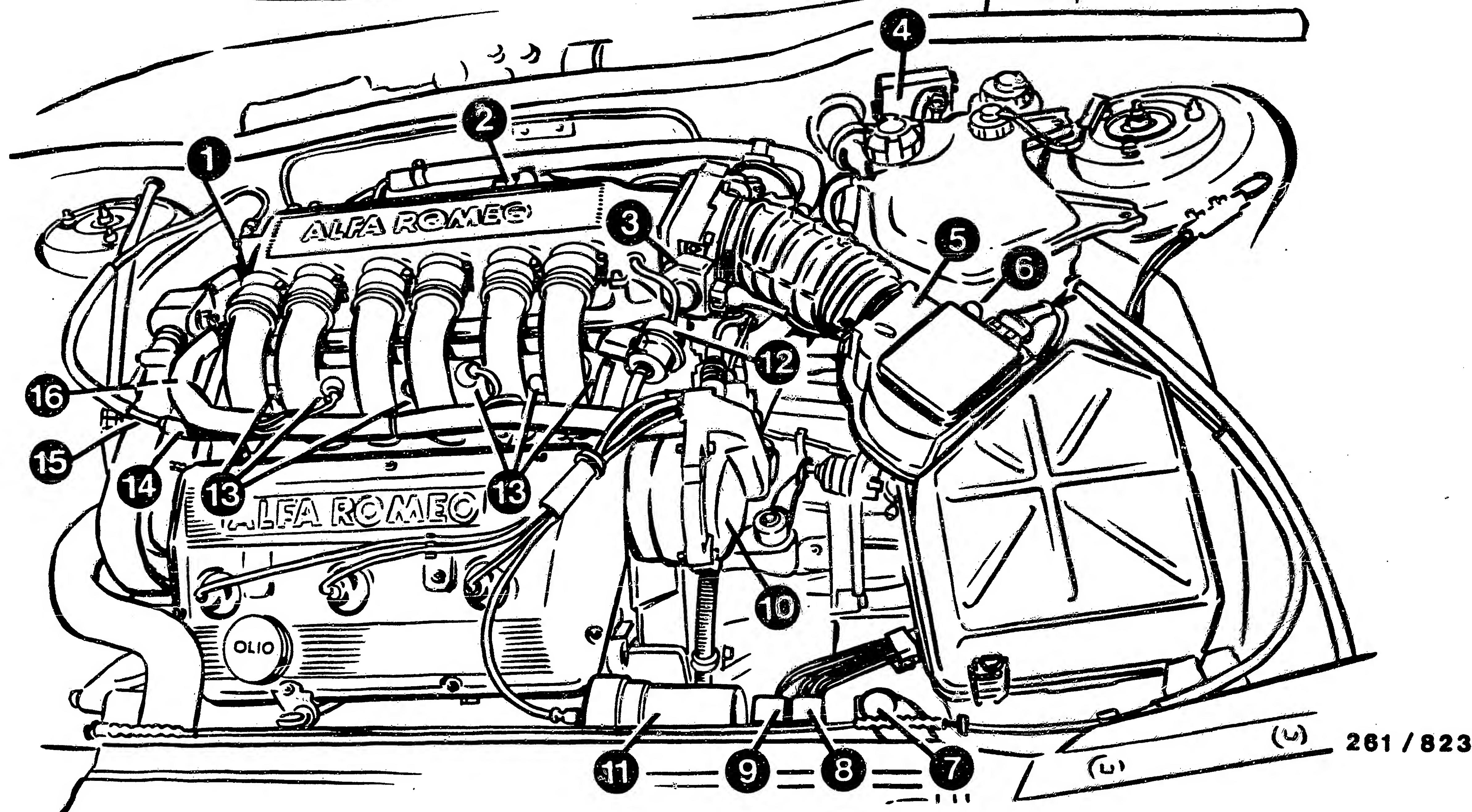
Remove control units before carrying out electric welding work.

TESTERS AND TOOLS

Name	Designation	Part no.
Motortester	e.g. MOT 201	0 684 000 201
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Exhaust-gas analyzer	e.g. ETT 008.02	0 684 100 802
	ETT 008.03	0 684 100 803
Multimeter (internal resistance min. 20 k Ω /V)	e.g. Digital multimeter	
	MMD 301	0 684 500 301
Pressure gauge 6 bar	Quality class 1.0	1 687 231 154
	Scale division 0.1 bar	
or Pressure measuring device	KDJE-P 100	
or Pressure measuring device (no longer available)	KDEP 1034	
3-way line as connection part for KDJE-P 100 and KDEP 1034	KDJE-P 100/13	
Set of test leads		1 687 011 208

TEST EQUIPMENT AND TOOLS (continued)

Description	Part no.
Feeler gauge for measuring sensor air gaps (up to 1 mm)	Commercially available
Lubricant for engine-speed and reference-mark sensor	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Test lead 2-pole, for measuring resistances and signals e.g. at injection valves	1 684 463 093
Test leads for correct connection of testers at component plugs	KDZS 0004 (2.8 mm wide) KDZS 0005 (6.3 mm wide)
Mounting paste VS 14016 Ft for Lambda sensor and exhaust-gas screw plug	5 960 080 105
Hose clamber for pinching off fuel and air hoses	Commercially available

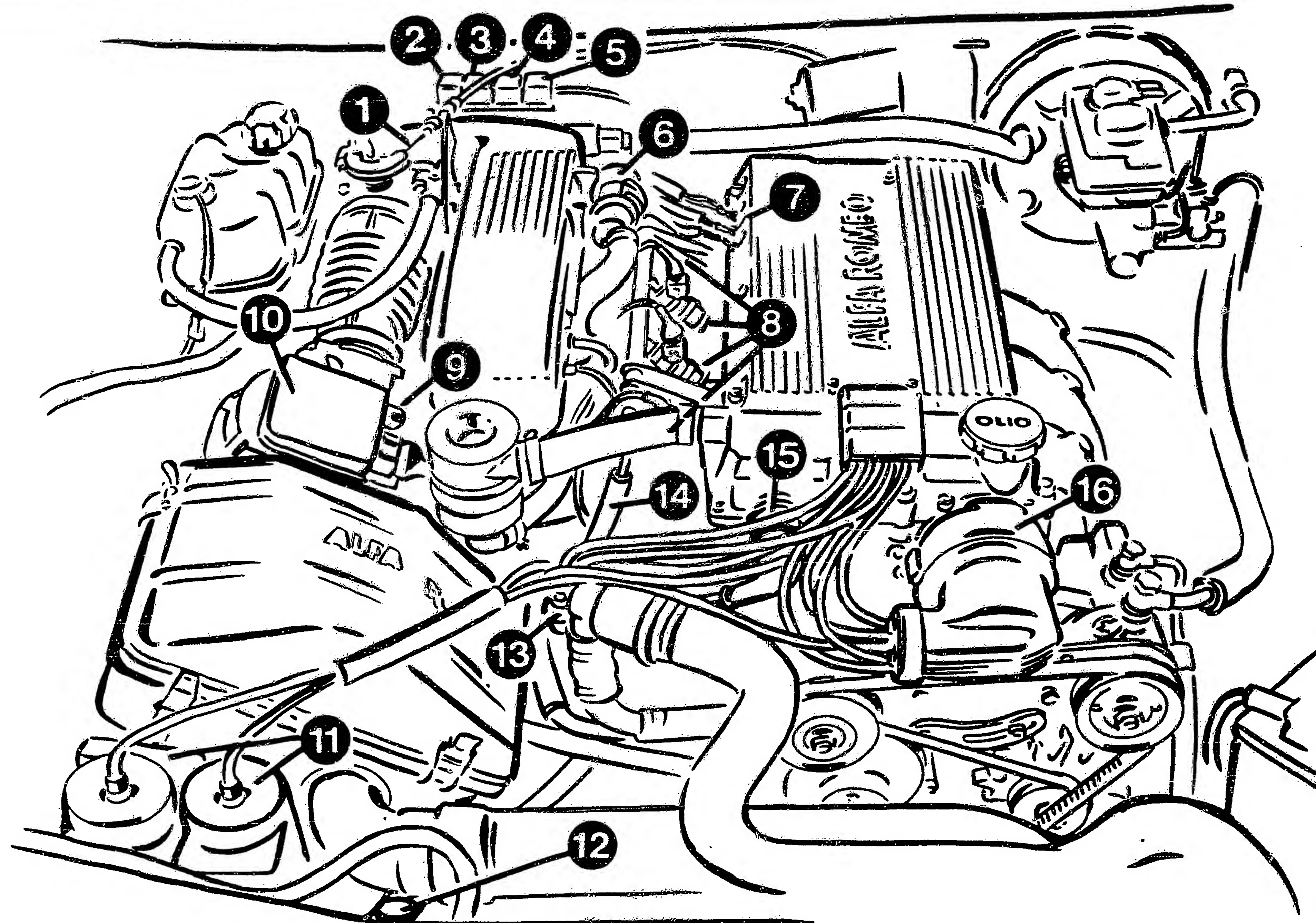


- 1 = Motronic ground terminals
- 2 = Idle actuator (single-wind. rot. act.)
- 3 = Throttle-valve switch
- 4 = Battery terminal
- 5 = Air-flow sensor
- 6 = CO adjusting screw (potentiometer)

- 7 = Self-diagnosis socket
- 8 = Main relay
- 9 = Pump relay
- 10 = High-tension distributor
- 11 = Ignition coil
- 12 = Fuel pressure regulator

- 13 = Solenoid-operated injection valves
- 14 = Fuel-distribution pipe
- 15 = Fuel-pressure measurement point (fuel inlet)
- 16 = Temperature sensor (engine)

INSTALLATION POSITION OF COMPONENTS (Alfa 164 3.0 V6)



261 / 824

- 1 = Accelerator
- 2 = Fuel pump relay
- 3 = Main relay
- 4 = Relay, camshaft switching
- 5 = Relief relay
- 6 = Idle actuator (single-winding rotary actuator)

- 7 = Motronic ground terminals
- 8 = Solenoid-operated injection valves
- 9 = CO adjusting screw (potentiometer)
- 10 = Air-flow sensor
- 11 = Ignition coils
- 12 = Self-diagnosis socket

- 13 = Ignition distributor 1
- 14 = Fuel-pressure measurement point
- 15 = Solenoid valve for camshaft switching
- 16 = Ignition distributor 2

INSTALLATION POSITION OF COMPONENTS (CONTINUED) (Alfa 75 Twin Spark)

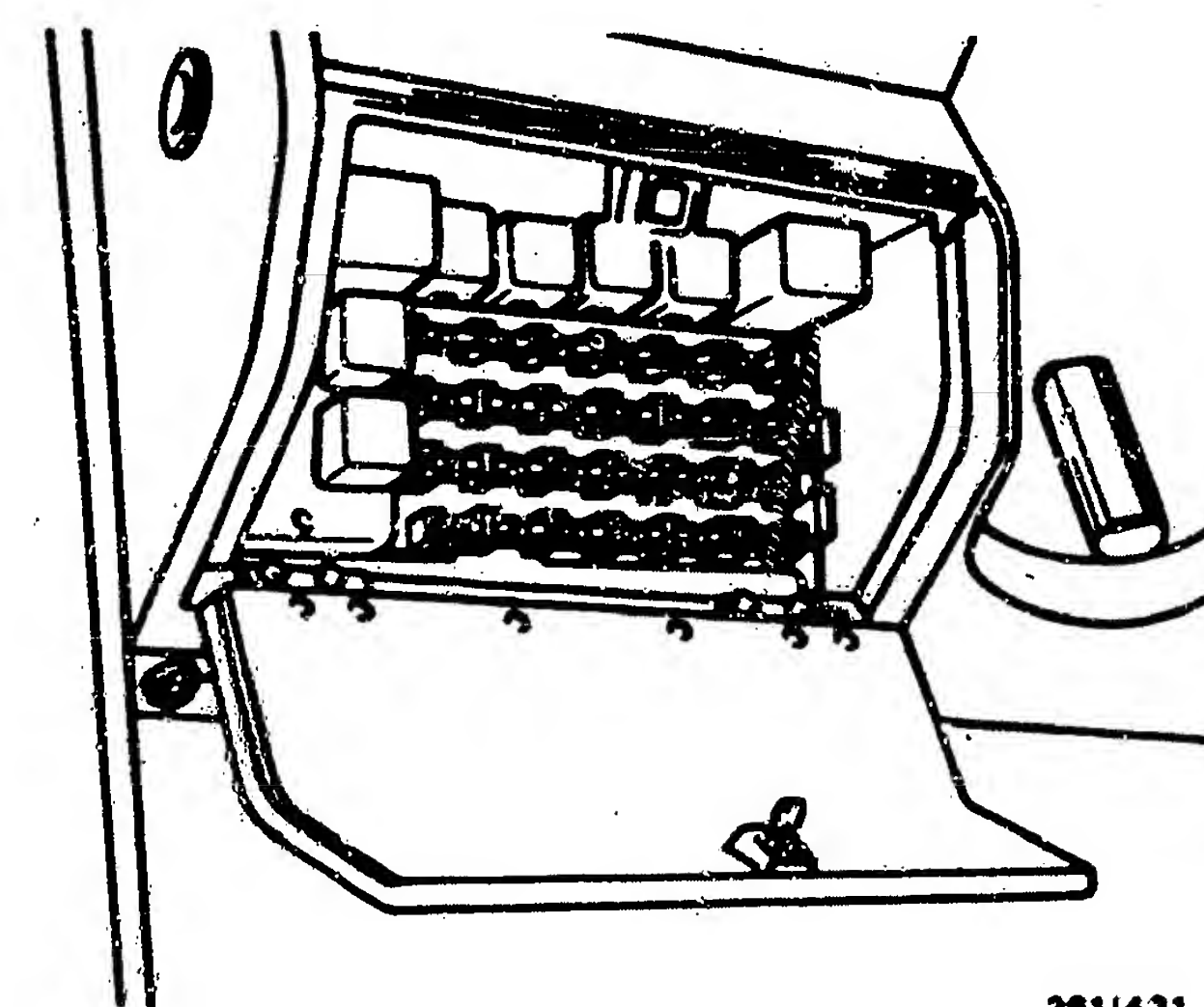
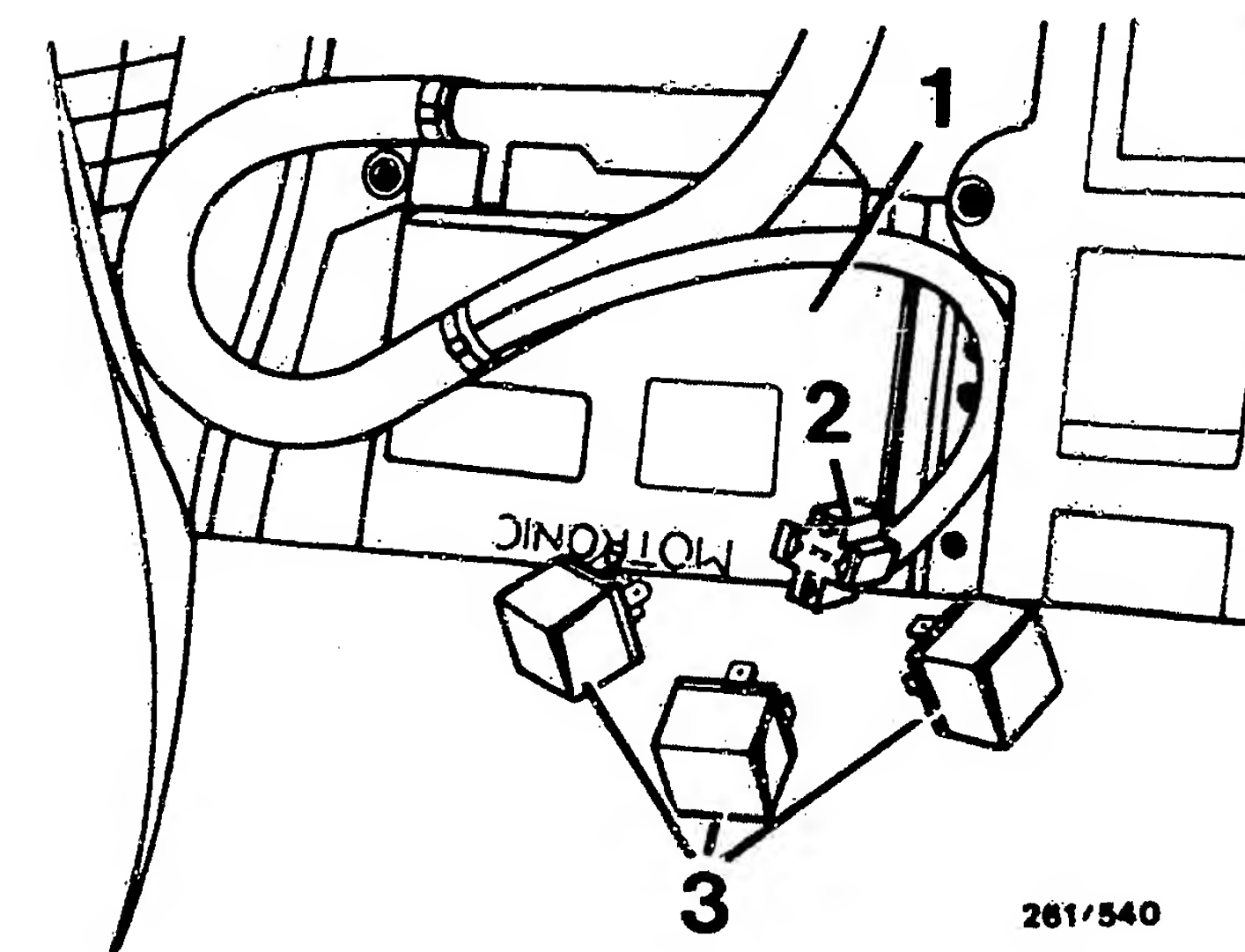
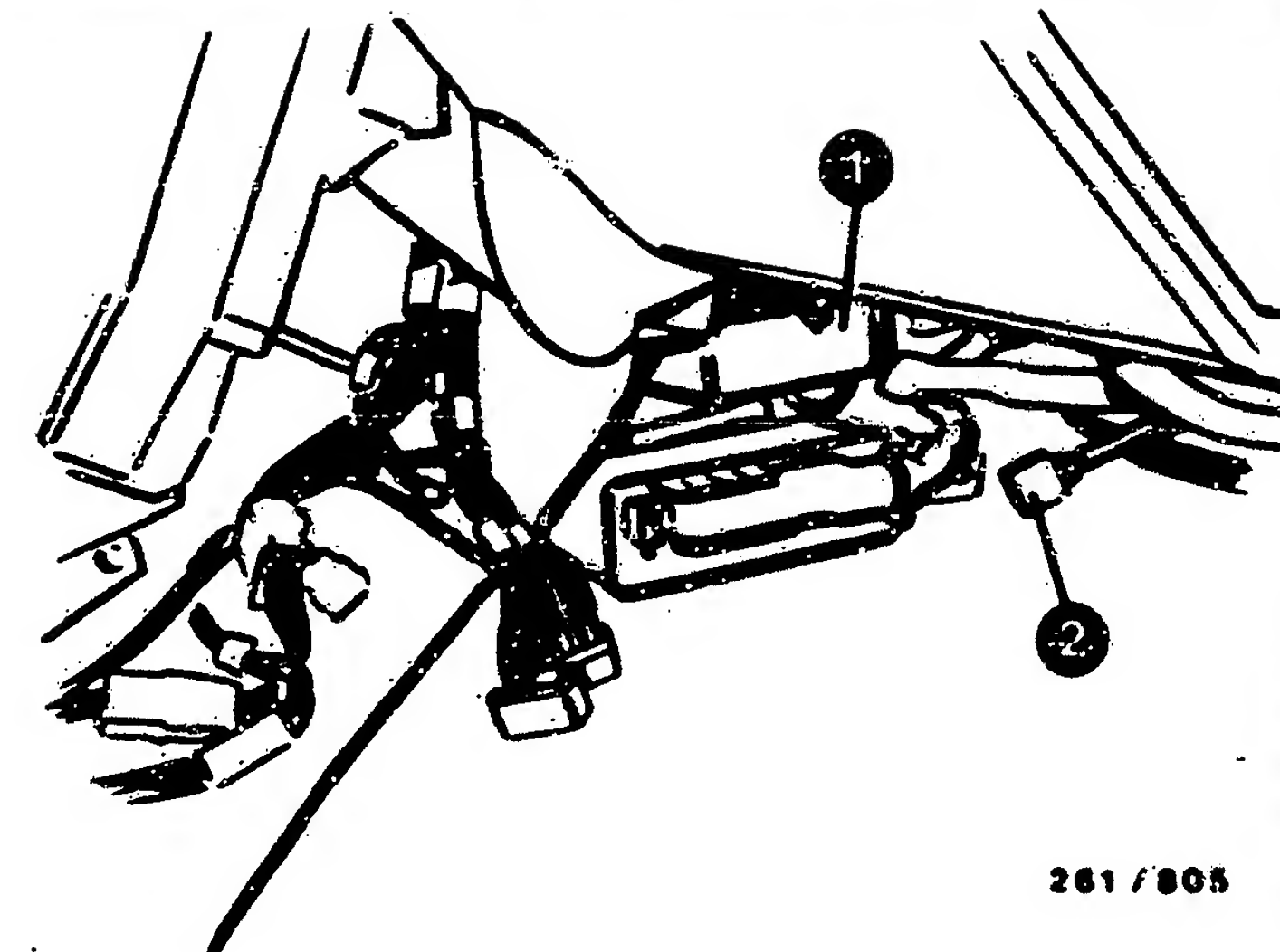
INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The installation locations always refer to the direction of travel.

- * Control unit:
Alfa 164 3.0 V6: Above the ABS control unit (top picture, Item 1)
Alfa 75 Twin Spark: Behind mat on passenger's side (center picture, Item 1).
- * Encoding connection:
5-pole relay frame at wiring harness in vicinity of control unit (top and center pictures, Item 2).
- * Fuse box:
Beneath instrument panel, left (bottom picture).
- * Temperature sensor (intake air):
In air-flow sensor.
- * Temperature sensor (engine), 2 l engine:
On intake side of engine block (blue plug).
- * Throttle-valve switch (Alfa 75 Twin Spark):
At throttle-valve assembly, bottom.
- * Pressure regulator:
At fuel-distribution pipe
- * Pressure damper:
In front of pressure regulator.
- * Active-carbon container (Cat. only):
Underneath vehicle, ahead of front wheel house (Alfa 164 3.0 V6, left / Alfa 75 Twin Spark S, right).
- * Tank-ventilation switching valve (Cat. only):
Alfa 164 3.0 V6: In vicinity of active-carbon container.
Alfa 75 Twin Spark S: Next to radiator, right.

Note:

The 2 l / 4-cyl. engine is a transverse engine in the Alfa 164 in contrast to the Alfa 75.



HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts with Coordinate B03 and contains customer complaint (fault symptom/fault characteristic feature) together with several possible causes in each case (component faults) and coordinate information for detailed trouble-shooting. If no coordinates are given, this is because the causes concerned do not require any test instructions.

In the event of a clearly established customer complaint, proceed consecutively and step by step as indicated in the trouble-shooting instructions in the stated sequence of possible causes.

Trouble-shooting should always be commenced with self-diagnosis (if provided) or with the universal test adapter (if envisaged). Only then should trouble-shooting be continued in line with the trouble-shooting chart.

In the event of a customer complaint which is not clear-cut, all causes indicated in the trouble-shooting chart must be tested. In order to avoid incorrect measurements, all causes are to be checked in the specified sequence (on account of interlinkage of test steps).

If the cause of the customer complaint has still not been eliminated after testing all possible faults, fit new prescribed ignition coil and/or trigger box/control unit.

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component tests indicated in the trouble-shooting chart. It is sub-divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/connection diagrams linked to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be applied and the tests performed in the sequence indicated there.

Following fault elimination, repeat test as a check.

TEST PREREQUISITES:

- Battery fully charged
- Engine in proper mechanical working order (e.g. compression, valve clearance etc.)
- Engine at operating temperature of approx. +80°C (if necessary)
- Proper connection of all connectors of wiring harness

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on.
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

												Cause (component fault)	Coord.
*	*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis	B07
*												Voltage at control unit	D15
*		*				*	*					Solenoid-operated injection valves	D19
	*	*	*									Idle actuator	D23
		*	*		*							Camshaft switching	D25
		*				*						Tank ventilation	E01F15
*												Engine-speed/reference-mark sensor	E03
*		*			*	*						Fuel pressure	E13
					*							Fuel delivery	E23
	*	*	*	*	*	*						Air-flow sensor	E25
		*	*	*								Noise test	F03
		*	*									Idle contact	F05
					*							Full-load contact	F09
*	*	*	*									Air-intake system	F11

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

										Cause (component fault)	Coord.
*		*		*	*					Ignition coil	F19
*		*	*	*	*					Primary signal	F21
		*	*	*	*	*				Secondary pattern	F23
		*	*	*						Interfer.-suppr. resistors	F23
					*					Interference	D21
		*								Overrun cutoff	F25
		*								Idle speed	F27
*	*	*	*		*	*		*	*	Ignition angle	G01
		*								Exhaust gas	G03
		*			*					Throttle valve	F05F06
*	*	*	*	*	*	*		*	*	Control unit	---

USE OF SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE, AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM

The control unit installed in this vehicle incorporates self-diagnosis. For this reason, trouble-shooting must start with self-diagnosis.

Activation of self-diagnosis is described starting on Co-ordinate B07. The self-diagnosis test table starting on B13 includes:

- Fault indication (flashing code)
- Components or system functions inspected
- Test instructions/conditions
- Connection terminals
- Set-value information
- Co-ordinate information for trouble-shooting and elimination in the subsequent self-diagnosis trouble-shooting program.

USING THE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (Continued)

The self-diagnosis trouble-shooting program is divided into three columns starting at Coordinate B19.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and on how to rectify the fault.

The right-hand column contains the illustrations/terminal diagrams belonging to the text, together with explanations.

If the questions in the left-hand column can be answered conclusively with "yes", continue trouble-shooting with the next box down.

If the answer to the question is "no", branch to the center column and carry out the tests in the order given there.

After rectifying a fault, repeat the test as a check.

If the self-diagnosis indicates a fault, but no system fault or component fault was found during trouble-shooting, try replacing the control unit.

If no more fault is indicated in self-diagnosis and the customer complaint has still not been eliminated (symptom of trouble), continue trouble-shooting with the trouble-shooting chart starting at Coordinate B03.

SELF-DIAGNOSIS

The self-diagnosis can only be activated and evaluated with the evaluation unit KDAW 9980 or with a commercially available nonlocking switch (and if there is no fault lamp in the instrument panel) an LED test lamp with a series resistance of approx. 600 Ω .

Connect evaluation unit KDAW 9980 (top picture):

Connect button of evaluation unit (sockets 3 and 4) between pin 8 (see top view of self-diagnosis socket, center picture) of self-diagnosis socket and vehicle ground.

If there is no fault lamp installed in the vehicle, use test lamp of evaluation unit.

To do so, connect socket 2 of evaluation unit to pin 6 of self-diagnosis socket and socket 1 (red) to battery positive.

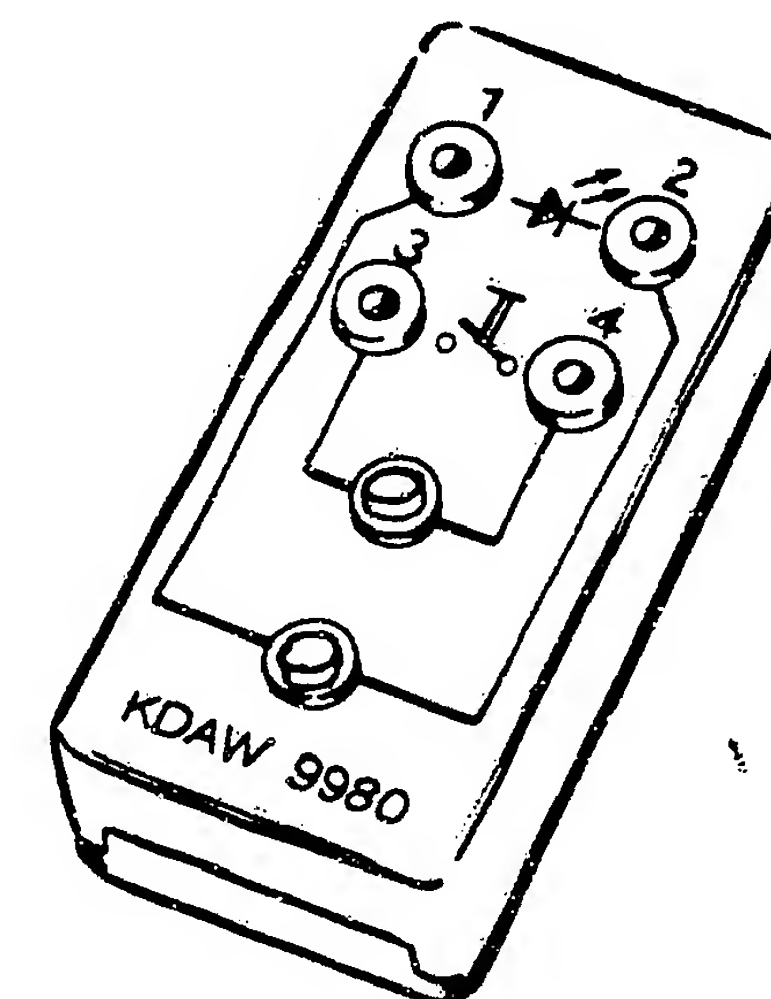
Note :

1. The battery in the Alfa 164 is installed on the left-hand side of the trunk. A battery terminal (bottom picture) is located in the engine compartment on the left-hand side of the bulkhead.

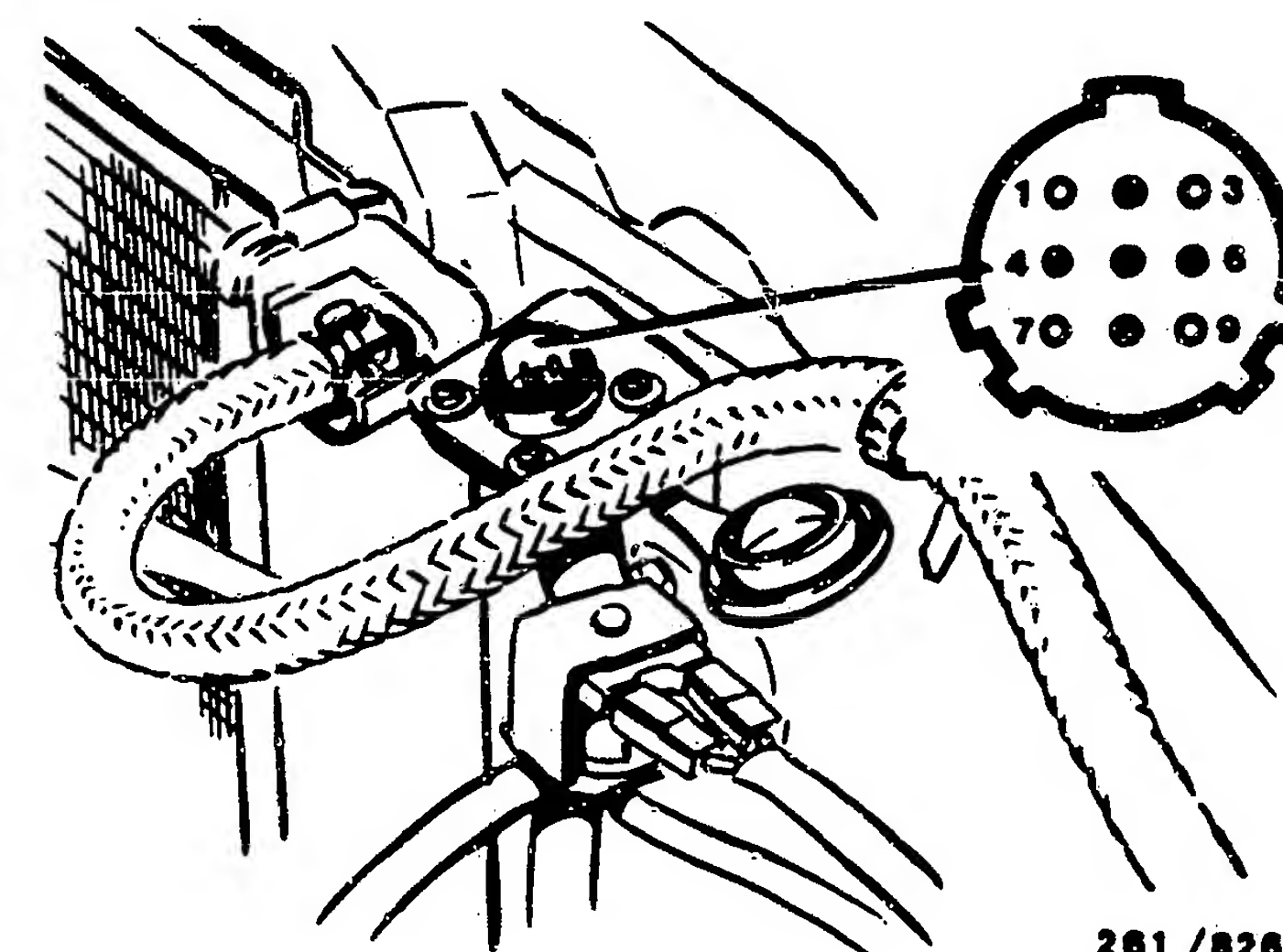
2. Suitable adapter leads from the set of test leads (No. 1 687 011 208) can be used to connect the evaluation unit to the self-diagnosis socket.

C a u t i o n , take care not to cause a short-circuit!

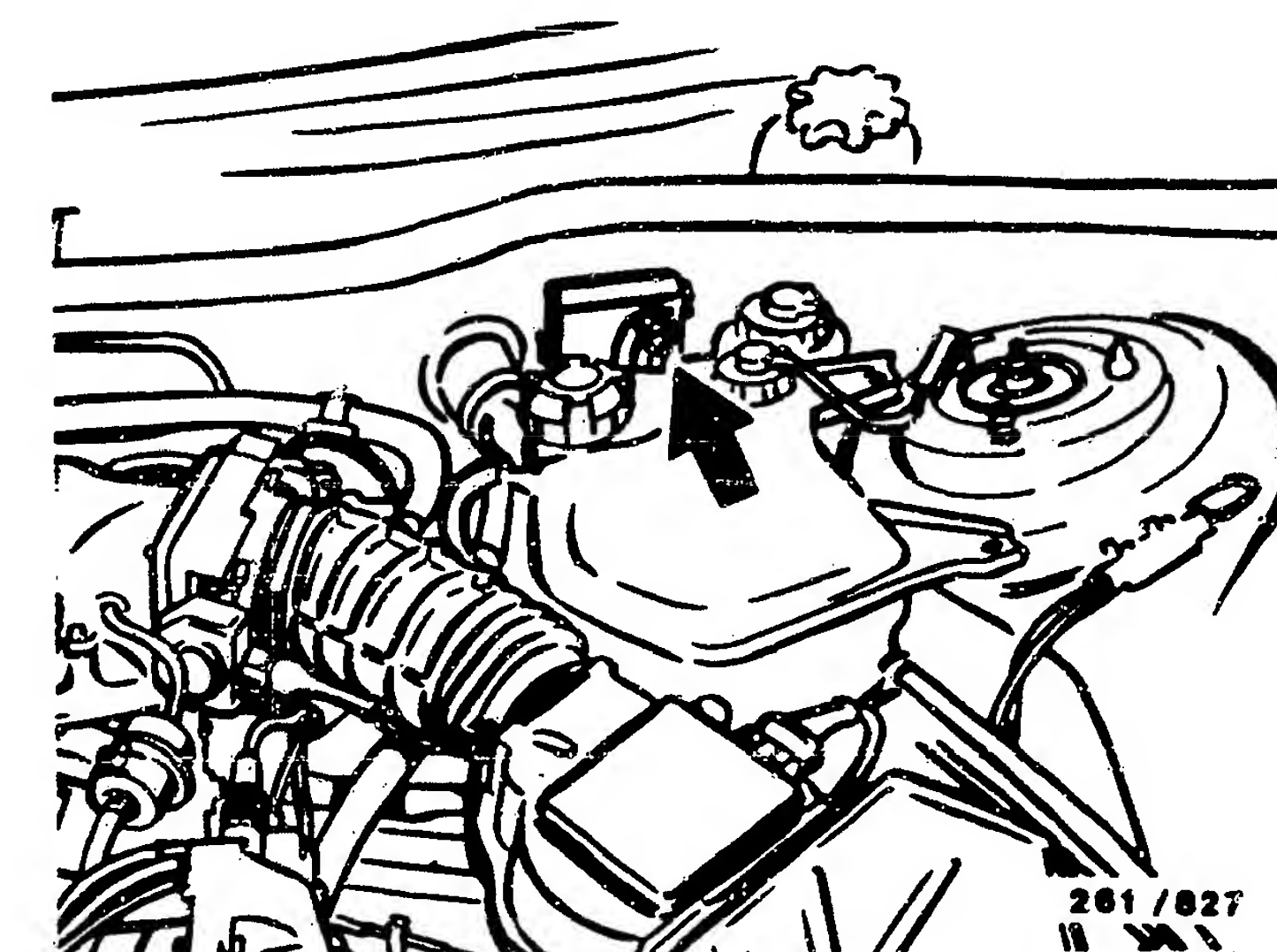
Pay attention to consecutive numbering of pins and position of encoding lugs (see center picture).



460 / 1714



261 / 826



261 / 827

SELF-DIAGNOSIS (continued)

Flashing fault code evaluation:

The flashing code for each fault consists of four flashing-pulse blocks. Each block represents a number and contains between 1 and 9 pulses. One pulse corresponds to the number 1; 9 pulses correspond to the number 9. The fault lamp lights up briefly with each pulse. The pause between the blocks is longer than that between the individual pulses. The respective flashing-code word (e.g. 1213) is constantly repeated. For delimitation purposes, there is a pulse pause of approx. 2.5 seconds between the flashing code words. The next fault is output by way of renewed stimulation. A maximum of 5 faults can be stored.

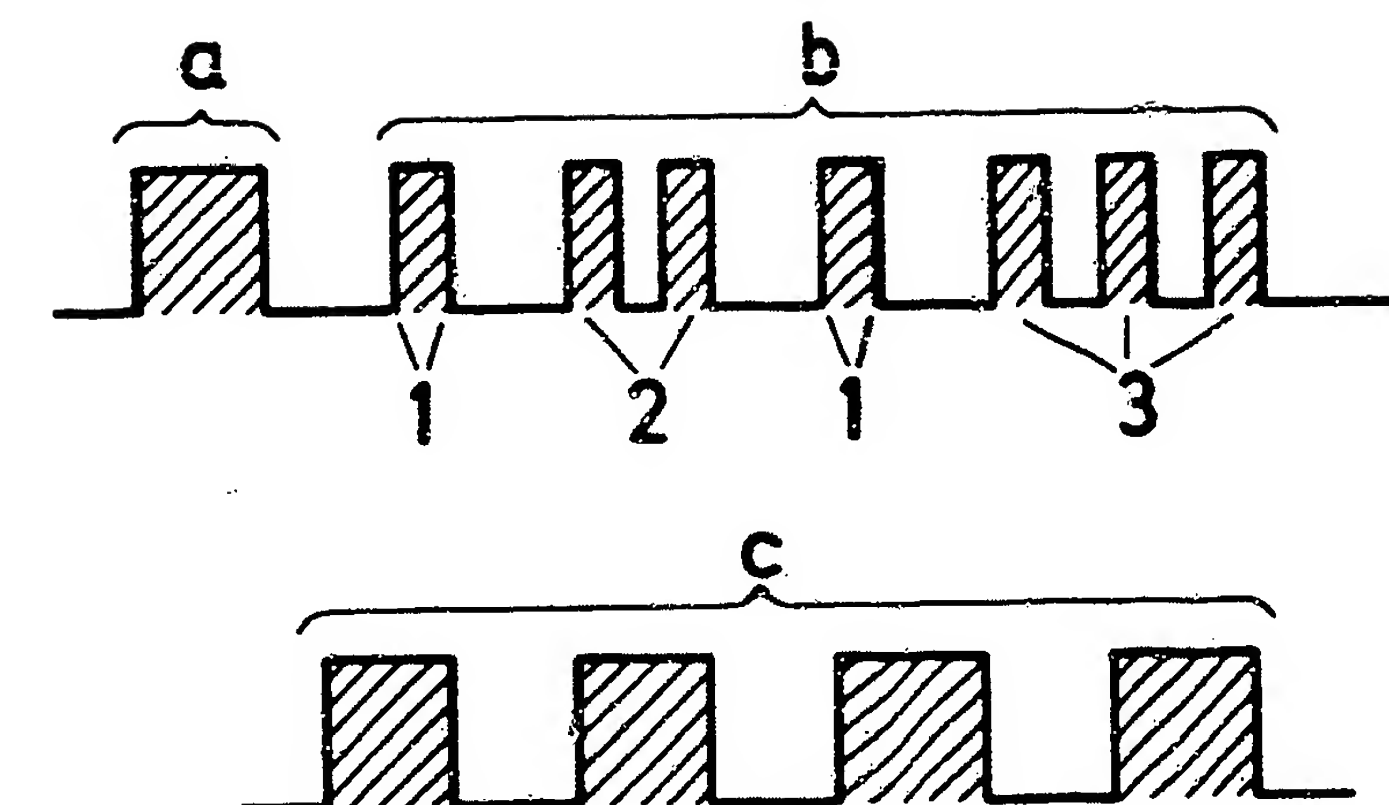
Activation of self-diagnosis (fault output):

1. Switch on ignition (fault lamp comes on)
2. Effect stimulation for between 2.5 and 5 seconds, i.e. press button
3. Self-diagnosis commences following 2.5 s start pulse with output of 1st fault.
If no fault is stored, "4 4 4 4" or "1 4 4 4" is indicated.
4. Effect renewed stimulation for between 2.5 and 5 seconds, in order to read out the 2nd fault (if applicable) etc.
5. When all stored faults have been output, the flashing code "End of output" appears, i.e. 0 0 0 0 or 1 0 0 0
6. Switching off the ignition effects higher-ranking termination of the self-diagnosis

Clearing fault memory:

The fault memory is cleared:

1. If stimulation is effected for at least 10 seconds during output of the flashing code "End of output".
2. By interrupting the continuous voltage supply (disconnection of control unit or negative terminal of battery).



261/828

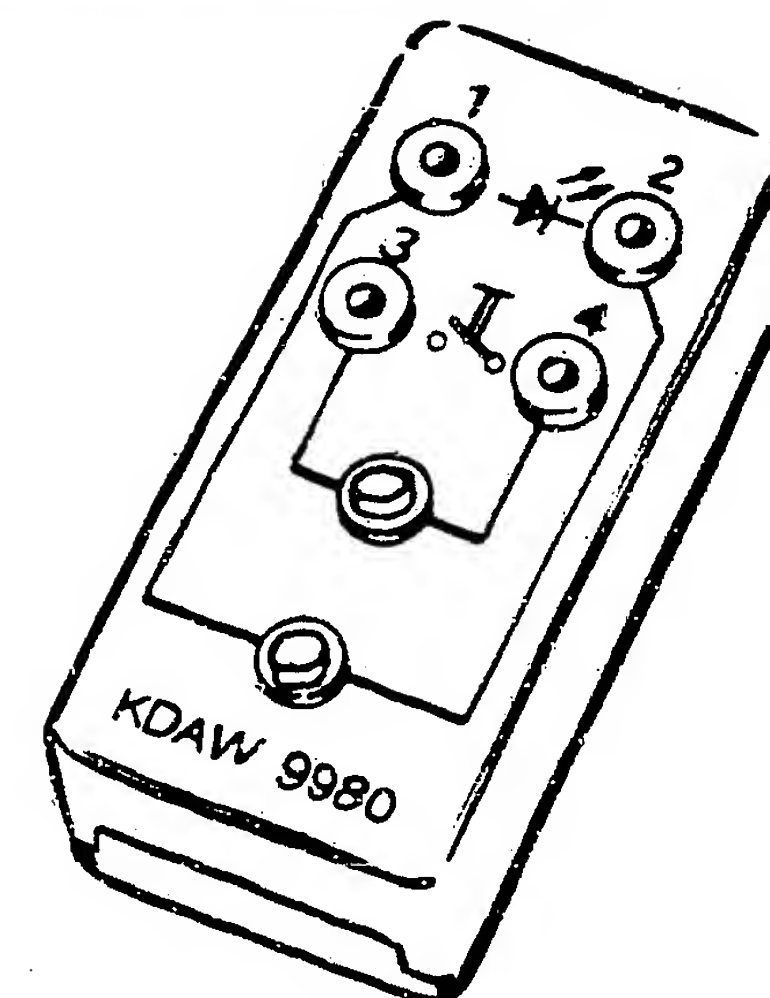
a = Start pulse
b = Fault code 1 2 1 3
c = Flashing code 0 0 0 0
 (end of output)
Hatched pulse area ≡
Fault lamp lights up

SELF-DIAGNOSIS (continued)

Activation of actuator diagnosis:

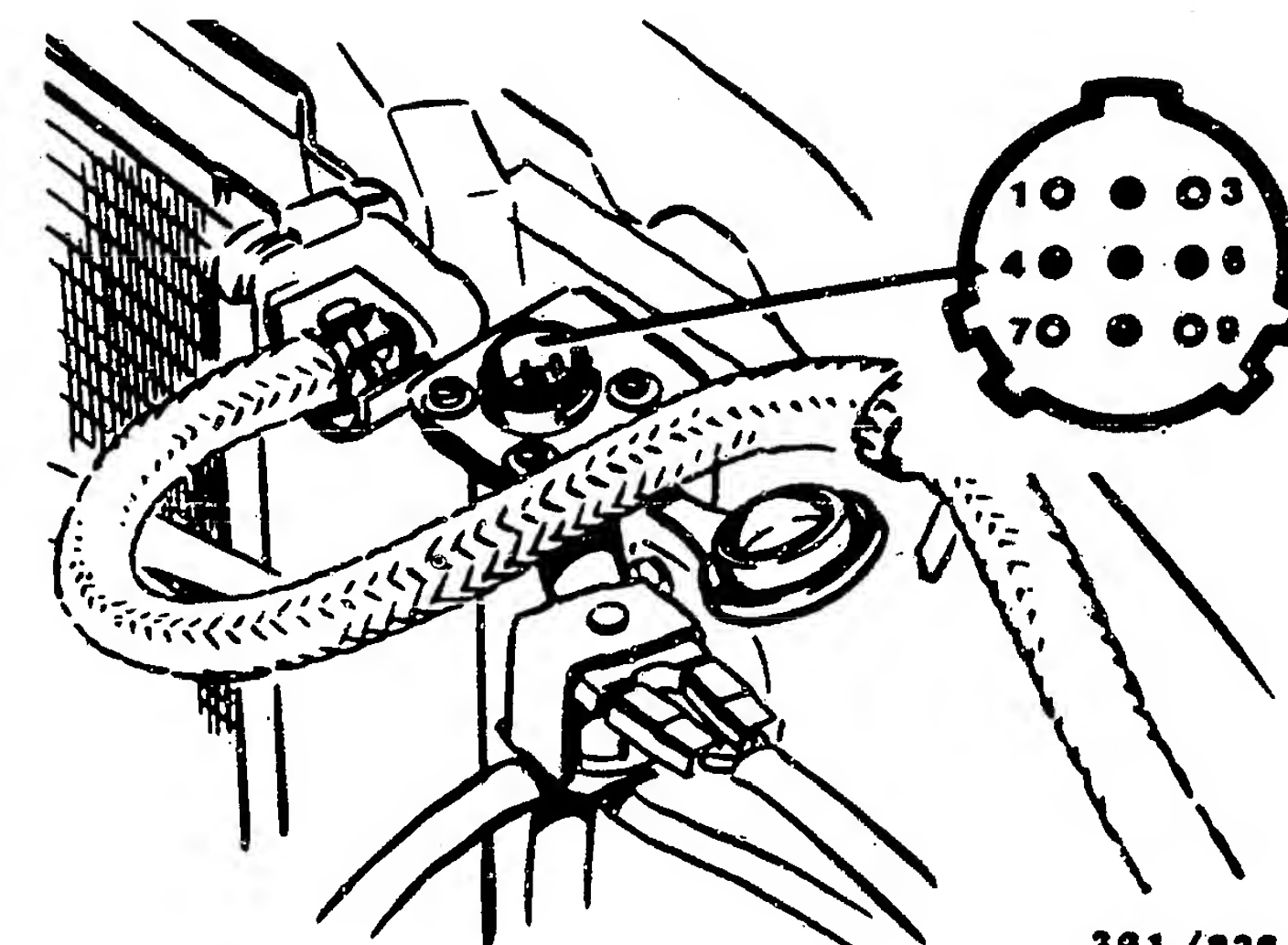
Note:

1. The actuation of each component is accompanied by the output of the corresponding flashing-code word (this is repeated in each case until next stimulation is effected)
 2. "Stimulation process" means: Press button of evaluation unit for between 2.5 and 5 seconds
- First stimulation process (flashing code 1 4 1 1):
Start with stimulation even before switching on ignition.
During stimulation, switch on ignition and wait for at least 2.5 seconds. Then terminate stimulation.
Fault lamp lights up for approx. 2.5 seconds (start pulse) and then "1 4 1 1" flashes up.
This process, i.e. start pulse + flashing code, is repeated until the next stimulation process is effected.
In parallel to this, the injection valves are periodically actuated (clearly audible).
 - Caution! In the event of residual fuel pressure, fuel is injected into the cylinders. Activation of this step should therefore be as short as possible.
 - Second stimulation process (flashing code 1 4 1 2):
Actuation of idle actuator (clearly audible)
 - Third stimulation process (flashing code 1 4 1 4):
Actuation of relay for camshaft switching
(Relay clearly audible, switching of solenoid valve can be seen with voltmeter)
Note: Only with 2 l engines
 - Fourth stimulation process (flashing code 1 4 1 3):
Actuation of tank-ventilation switching valves
(audible or can be seen with voltmeter at valve)
Note: Only for catalytic-converter versions and for closed tank ventilation with active-carbon container)
 - Fifth stimulation process (flashing code "End of output"):
Actuator diagnosis terminated.



460 / 1714

Evaluating unit KDAW 9980



261 / 826

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	Coordinate
1 2 1 1	Supply voltage for control unit with engine running	Supply voltage too low: Test voltage dips at positive and ground terminal. Charge battery. Voltage supply too high: Test alternator regulator.	35(+), 5(-)	See brief instructions	B19
1 2 1 2	Throttle-valve switch Idle contact	Fault: Idle contact constantly closed. Idle contact closed in off position: Slightly depress accelerator pedal:	2	Approx. 0 Ω Infinity Ω	B23
1 2 1 3	Throttle-valve switch Full-load contact	Fault: Full-load contact constantly closed. Full-load contact closed in full-throttle position: Release accelerator pedal somewhat:	3	Approx. 0 Ω Infinity Ω	B27
1 2 1 4	Temperature sensor (engine)	Check temperature sensor and lead for open-circuit and short-circuit to ground. Temperature-sensor resistance: at +15...+30°C: at approx. +80°C:	13	— 1450...3300 Ω 280... 360 Ω	C03
1 2 1 5 (without Cat. only)	Idle potentiometer for CO adjustment	Fault: Wiper voltage too low (less than 0,1 V) or too high (greater than 4,9 V) Test potentiometer setting (and CO). To do so, measure voltage at term. 1 and 4 of air-flow sensor with ignition switched on: If test specification is not attained, change potentiometer setting and, if applicable, test resistors at potentiometer or test corresponding leads in accordance with diagram for open-circuits and short-circuits.	30	0,1... 4,9 V	C07

SELF-DIAGNOSIS TEST TABLE (continued)

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Terminals	Set values	See Coord.
1 2 2 1	Air-flow sensor	Test lead to term. 7 for open-circuit, short-circuit to ground or to positive (5 V or UB), as well as for contact with term. 9 and term. 6. Test leads to term. 9 and term. 6 for open-circuit. Test resistances of air-flow sensor; between term. 7 and term. 6 (deflect sensor flap): between term. 9 and term. 6:	7, 9, 6	— See brief instructions	C13
1 2 2 2	Idle actuator and output stage (in control unit)	Fault: Short-circuit with respect to ground, with respect to battery voltage or open-circuit. Test leads for contact with ground, battery voltage or open-circuit; if O.K., control unit defective. Winding resistance at +15...+30°C:	33	 See brief instructions	C19
1 2 2 3 (Cat. only)	Lambda closed-loop control on rich or lean stop	Test CO content. Test intake system for leaks. Test fuel pressure. Injection valves defective.	—	See brief instructions	C23
1 2 2 4 (Cat. only)	Lambda sensor	Open-circuit in lead to lambda sensor, short-circuited to ground or battery voltage. Watch out for worn cable insulation! Sensor heater defective. Sensor clogged.	24	—	C25
1 2 2 5	Temperature sensor (intake air)	Check temperature sensor and lead for open-circuit and short-circuit to ground. Temperature-sensor resistance at +15°C...+30°C:	22	— See brief instructions	D01

SELF-DIAGNOSIS TEST TABLE (continued)

Fault indication Flashing code	Testing of component/function	Test instructions/Test conditions	Termi- nals	Set values	See Coord.
1 2 4 3	Fuel pump relay and output stage (in control unit)	Fault: Short-circuit to ground or open-circuit.* Short-circuit to battery voltage Test relay leads for open-circuit and short-circuits (to term. 85 and 86). Relay-coil resistance:	20	Approx: 50...150 Ω	D05
1 2 4 4 (Cat. only)	Tank-ventilation switching valve and output stage (in control unit)	Fault: Short-circuit to ground, to battery voltage or open-circuit. Test valve leads for open-circuits and short- circuits. Winding resistance at +15...+30°C:	34	See brief instructions	D07
1 2 4 5	Relay for camshaft actuation (2.0 l engines only)	Fault: Short-circuit to ground, to battery voltage or open-circuit. Check leads for open-circuits and short-circuits. Relay-coil resistance:	31	Approx. 50...150 Ω	D09
1 2 5 1	Control unit (memory content)	Control unit defective.	—	—	D11
1 2 6 5	Fault lamp and output stage (in control unit)	Fault: Short-circuit to ground or to battery voltage. Note: If fault lamp not connected, term. 17 must be open.	17	—	D13

* = Short-circuit to ground or open-circuit in fuel-pump-relay circuit can only be detected by self-diagnosis if at least one other output stage is defective.

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (1)

SELF-DIAGNOSIS FLASHING CODE 1211

Fault:
Supply voltage at control unit
term. 35 less than 10 V with engine
running.

Test voltage dips (contact
resistances) at ground terminal and
positive lead.

Terminals and plug connections must
be bright and corrosion-free.

Positive terminals affected:

At main relay (at relief relay as
well with 2 l engines) term. 87 and
term. 30 as well as at battery term-
inal B+ and ignition lock term. 15.

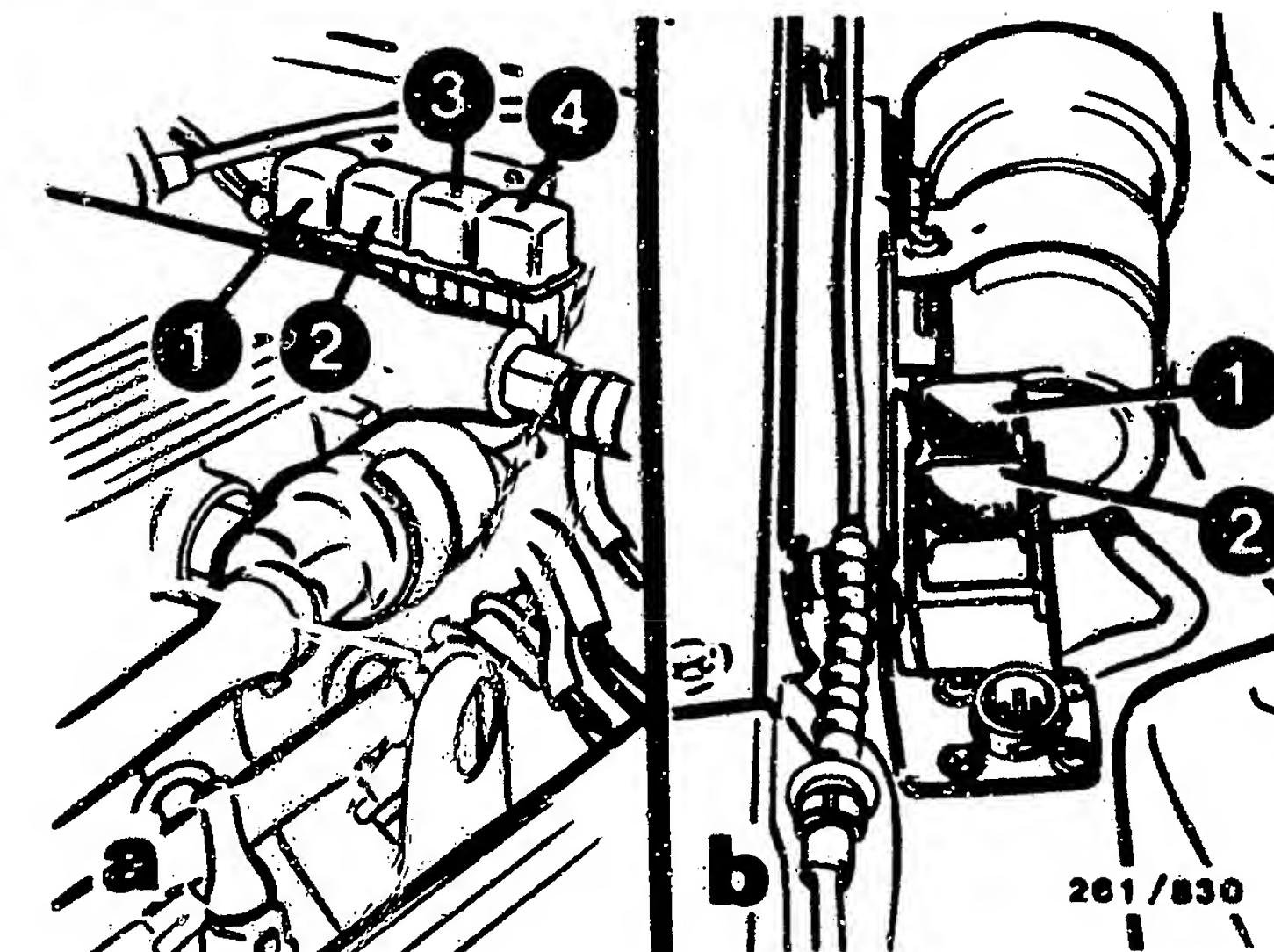
Test main relay and if necessary
relief relay and replace on a trial
basis.

Voltage dips eliminated?

Relay O.K.?

N>

Eliminate defects at terminals.
If necessary, replace plug-in
connections. Replace main relay.



Picture a: Alfa 75 Twin Spark S

Picture b: Alfa 164 3.0 V6

1 = Fuel pump relay

2 = Main relay (with red mark)

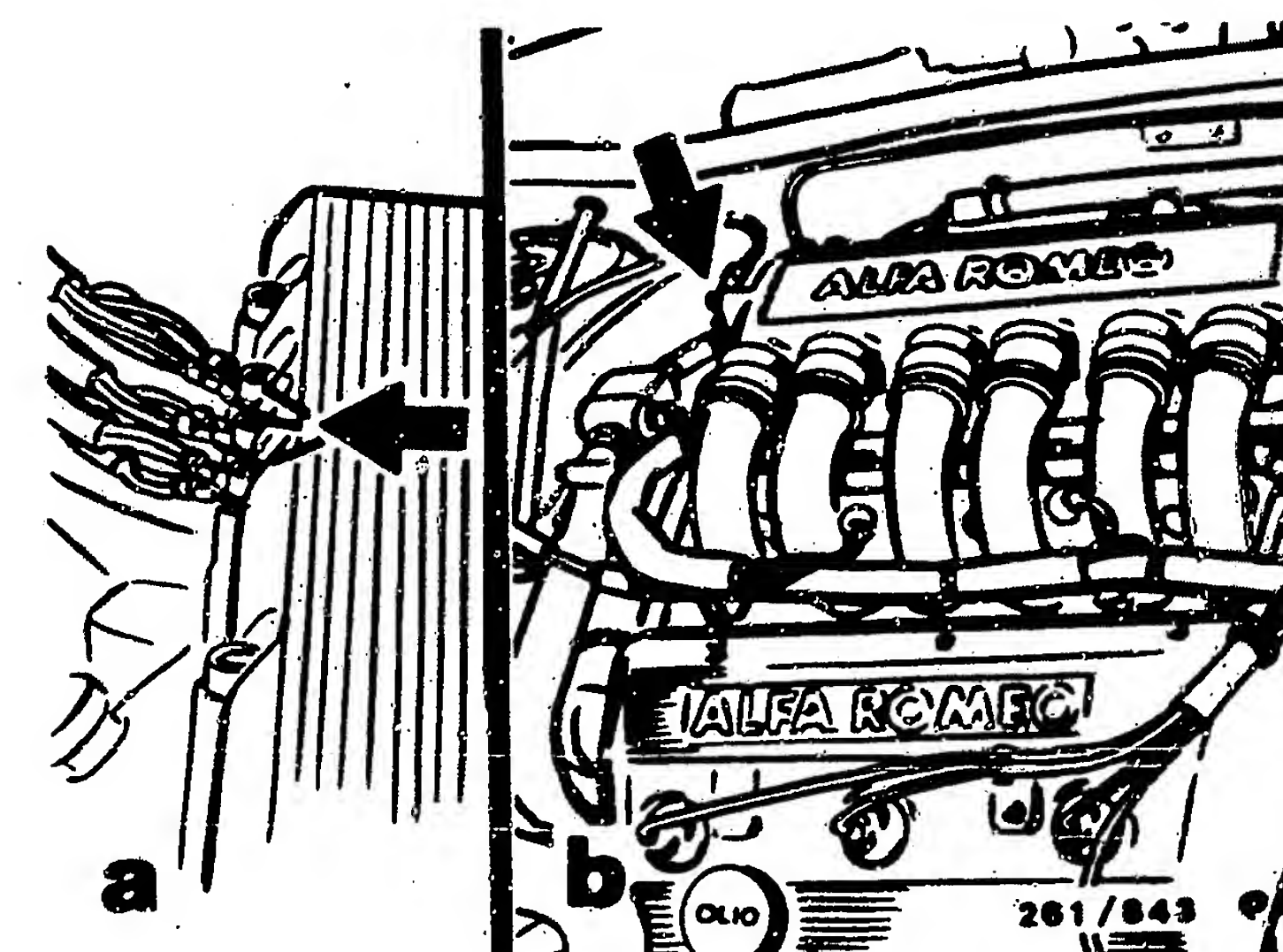
3 = Relay for camshaft switching
(2 l engines)

4 = Relief relay
(2 l engines)

Picture a: Alfa 75 Twin Spark S

Picture b: Alfa 164 3.0 V6

Arrows=Motronic ground terminals



Check state of charge of
battery.

Battery sufficiently charged?

N>

Charge battery.

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2)

V

SELF-DIAGNOSIS
FLASHING CODE 1 2 1 1

N>

Replace regulator.

Fault:
Supply voltage at control
unit term. 35 greater than 16 V
with engine running.

Check regulator.

Regulator O.K.?

Y

Return to self-diagnosis
test table B13

B21

<==>

B22

<==>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3)

SELF-DIAGNOSIS FLASHING CODE 1 2 1 2

N>

Idle contact in throttle-valve switch remains constantly closed or opens too late.

Test idle contact:

Detach plug at throttle-valve switch.

Throttle valve closed.

Connect ohmmeter to throttle-valve switch term. 2 and term. 18.

Set value: approx. 0 Ω (continuity)

Open throttle valve:

Reading must switch to infinity Ω after throttle valve has been opened somewhat.

Does resistance change from 0 Ω to infinity Ω ?

* Resistance value remains at 0 Ω up to full-load stop (idle contact not opening): Replace throttle-valve switch.

* Idle contact not closing (reading remains constant at infinity Ω) or idle contact opening too late:

Adjust throttle-valve switch.

* Requirements for throttle-valve switch adjustment:

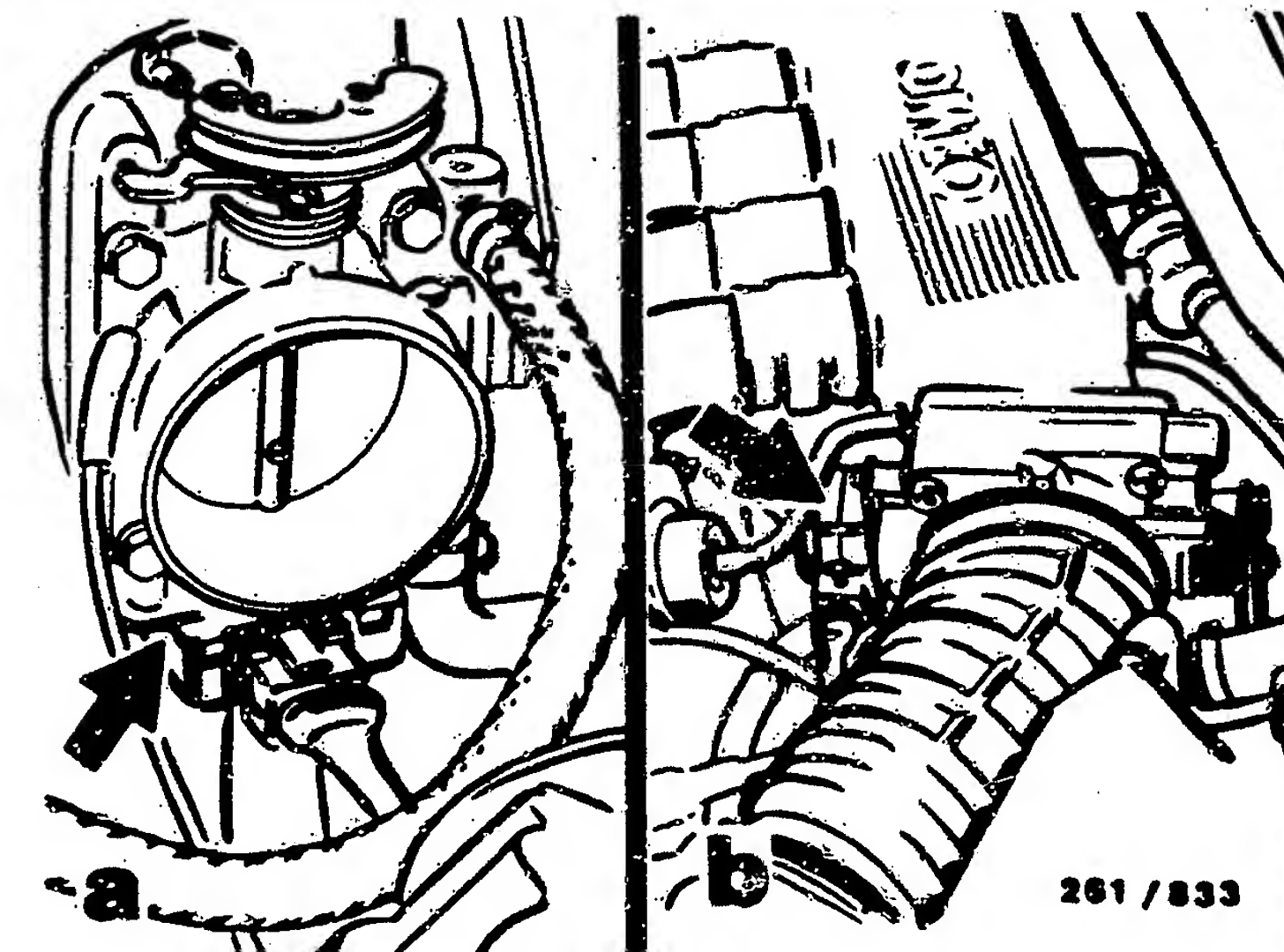
+ Throttle valve correctly adjusted? It must come up against the stop screw with the lever just before it sticks. Lock screw against turning.

+ Adjust throttle cable/linkage free of tension.

If kinked \rightarrow replace.

Adjusting the throttle-valve switch:

Slightly loosen fastening screws. Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch until the idle contact closes (microswitch clicks audibly). Reading 0 Ω . If not \rightarrow replace throttle-valve switch.

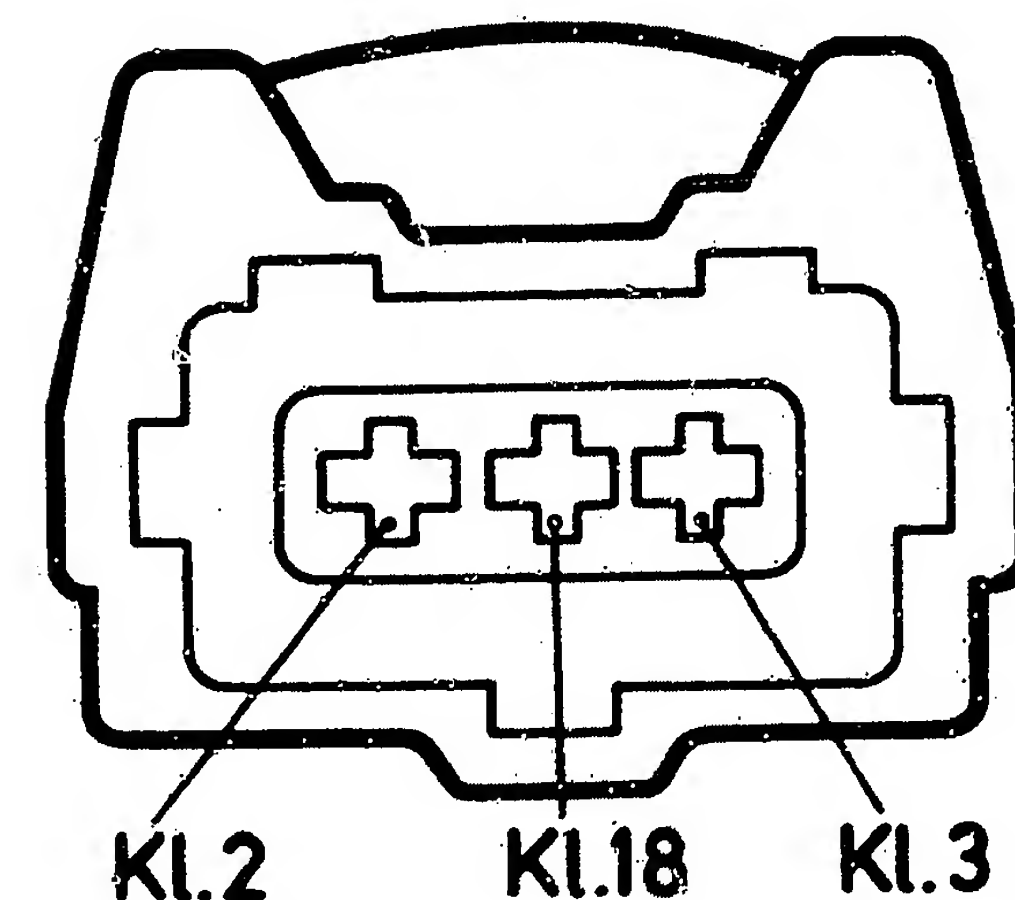


Picture a: Alfa 75 Twin Spark S

Picture b: Alfa 164 3.0 V6

Arrows = Throttle-valve switches

Throttle-valve-switch plug



Continued on next picture page

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3) CONTINUED (1)

Checking the adjustment:
Pull slightly on throttle
cable. Idle contact must open
(microswitch clicks audibly).

Reading: Infinity Ω

Eliminate short circuit on
lead.

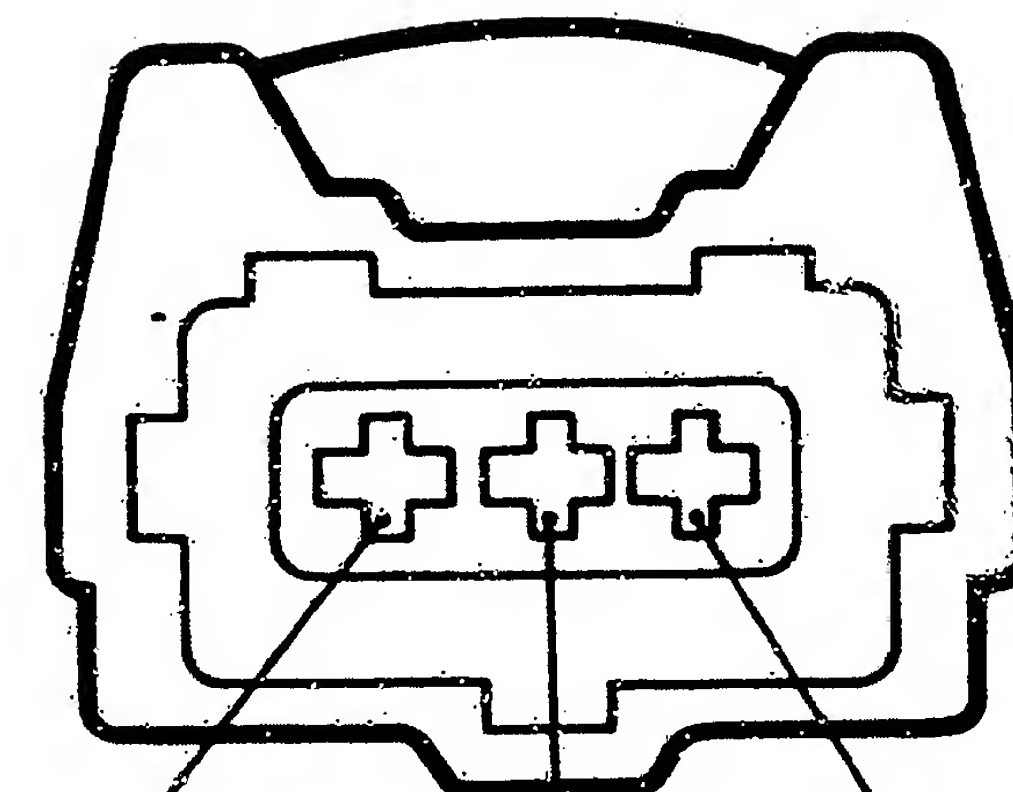
* Check leads to throttle-
valve switch for contact
with one another and with
ground:
Disconnect plugs from control
unit and throttle-valve switch.
Connect ohmmeter, one after
the other, to the plug of the
throttle-valve switch between
term. 2 and term. 18 as well
as term. 2 and ground.

Set value:
Infinity Ω in each case.

Watch for worn insulation
and loose contacts.

Set values obtained?

Return to self-diagnosis
test table B13



Kl.2 Kl.18 Kl.3 261/574

Throttle-valve-switch plug

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4)

SELF-DIAGNOSIS FLASHING CODE 1 2 1 3

N>

Full-load contact in throttle-valve switch remains permanently closed.

N o t e :

In the event of a fault, the fault lamp does not always light up during overrun.
The fault is however permanently stored.

Test full-load contact:

Detach plug from throttle-valve switch.

Connect ohmmeter to throttle-valve switch term. 3 and term. 18.

Open throttle valve as far as it will go.

Set value:

The reading switches from infinity Ω to 0 Ω prior to full-load stop.

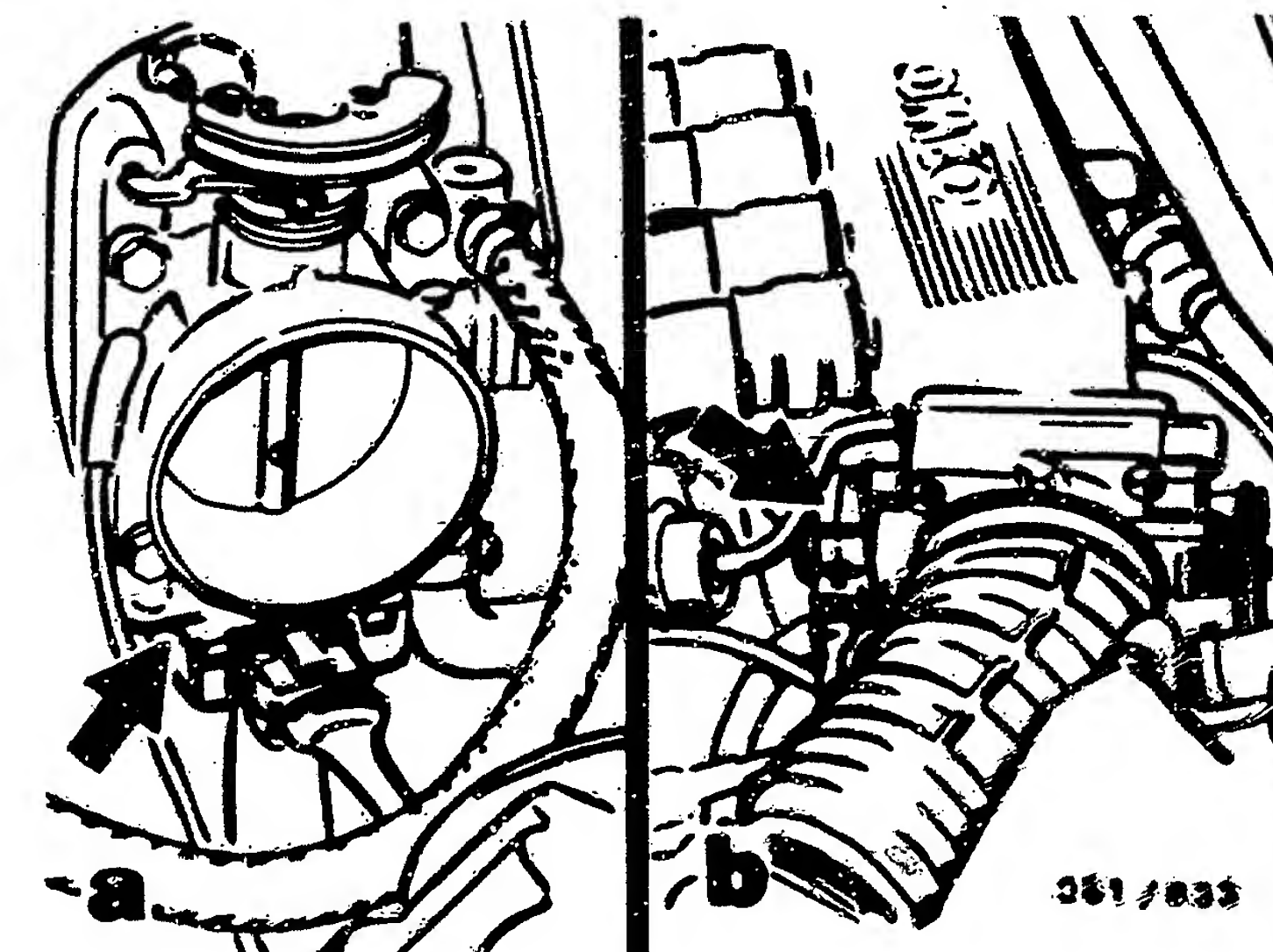
Does reading change from infinity Ω to 0 Ω ?

* Resistance value remains constantly on approx. 0 Ω (full-load contact does not open):
Replace throttle-valve switch.

* Full-load contact does not close (reading remains constantly on infinity Ω):
Check whether throttle valve is mechanically capable of opening fully.
If mechanical system is O.K., replace throttle-valve switch.

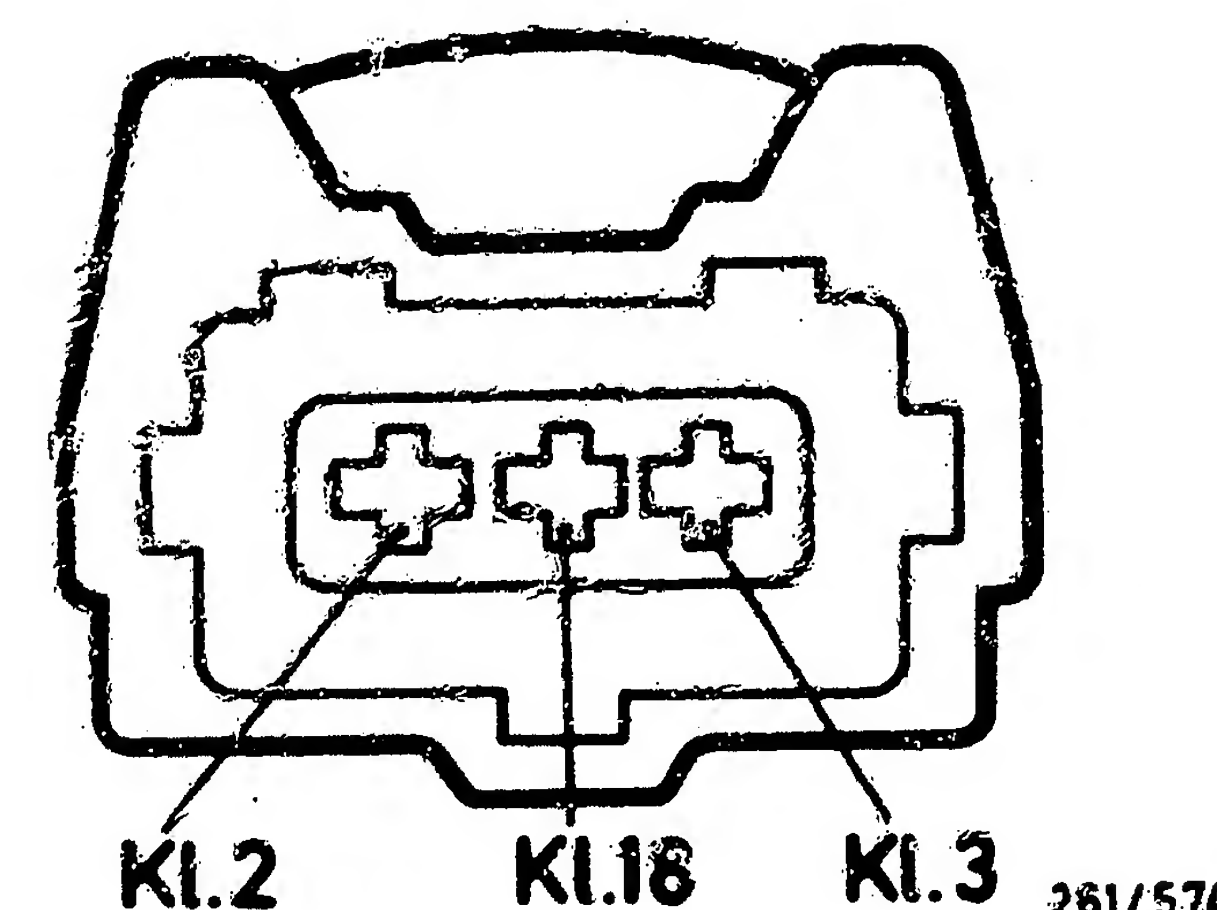
N o t e :

Full-load contact cannot be adjusted. If idle contact is correctly set, then the setting of the full-load contact is likewise correct.



Picture a: Alfa 75 Twin Spark S
Picture b: Alfa 164 3.0 V6
Arrows = Throttle-valve switches

Throttle-valve-switch plug



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (1)

V

* Check leads to throttle-valve switch for contact with one another and with ground:

Disconnect plugs from control unit and throttle-valve switch. Connect ohmmeter, one after the other, to the plug of the throttle-valve switch between term. 3 and term. 18 as well as term. 3 and ground.

Set value:
Infinity Ω in each case.

Watch for worn insulation and loose contacts.

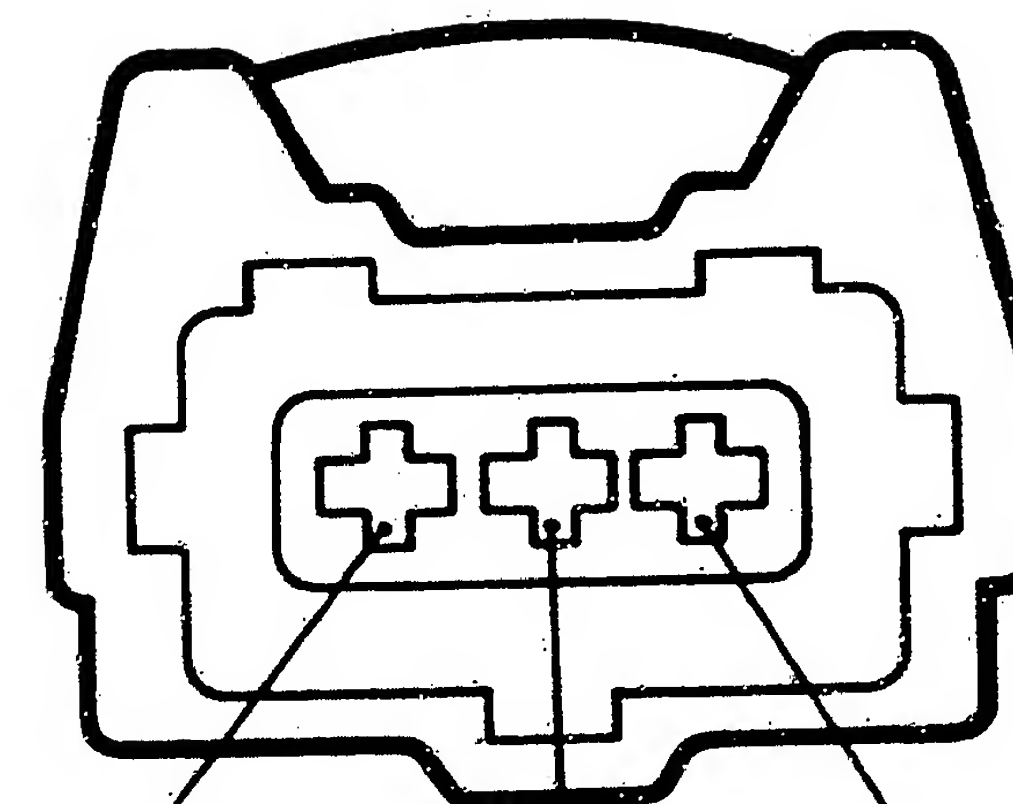
Set values obtained?

N>

Eliminate short circuit on lead.

Y

Return to self-diagnosis
test table B13



261/574

Throttle-valve-switch plug

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (5)

SELF-DIAGNOSIS
FLASHING CODE 1 2 1 4

N>

Replace air-flow sensor.

Test coolant-temperature sensor
(engine):

Disconnect plug from temperature
sensor.

Test resistance directly at plug
pins of temperature sensor:

Set value:
see brief instructions

Is set value reached?

Y

Visually inspect plug of temperature
sensor:

N>

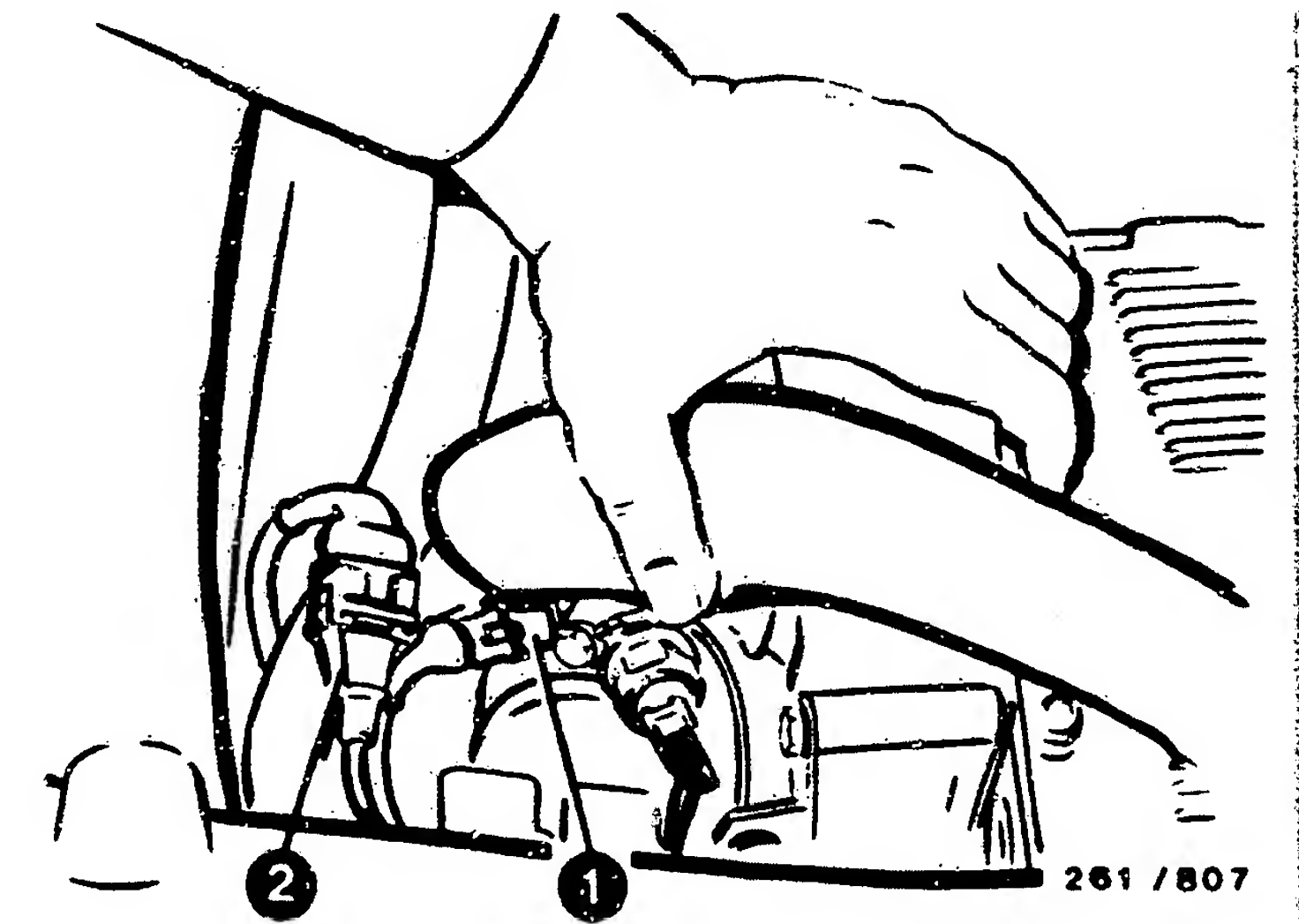
Eliminate defects on plug.
If necessary, replace plug
or spring contacts.

Plug properly connected, contacts
corroded? Spring contacts must be
engaged and it must not be possible
to push them back.

Is plug O.K.?

Y

Continued on next picture page



Alfa 164 3.0 V6:

1 = Temperature sensor (engine)

2 = Plug connection of engine-
speed/reference-mark sensor

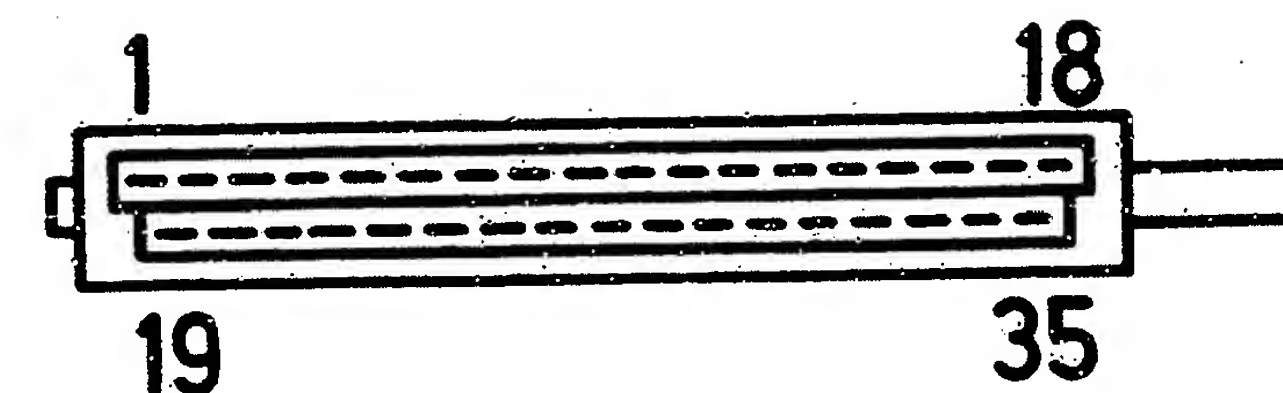
SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (5) CONTINUED (1)

Using ohmmeter, check leads to temperature sensor for open circuit and short circuit. From temperature-sensor plug to control-unit plug term. 13 and to vehicle ground.

Leads O.K.?

N>

Eliminate contact resistances, open circuits or short circuits on leads.

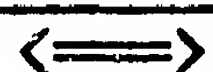


261/685

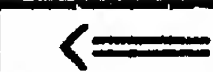
Top view of 35-pin control-unit plug of Motronic wiring harness

Return to self-diagnosis test table B13

C05



C06



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6)

SELF-DIAGNOSIS
FLASHING CODE 1 2 1 5

Malfunction in idle potentiometer
(in air-flow sensor) for CO adjust-
ment.

1). Voltage too low:

* Test lead from control unit term.
30 to air-flow sensor term. 1
with ohmmeter for short-circuit
(contact) to ground. Watch out for
worn cable insulation (insulation
damage) and loose contact.

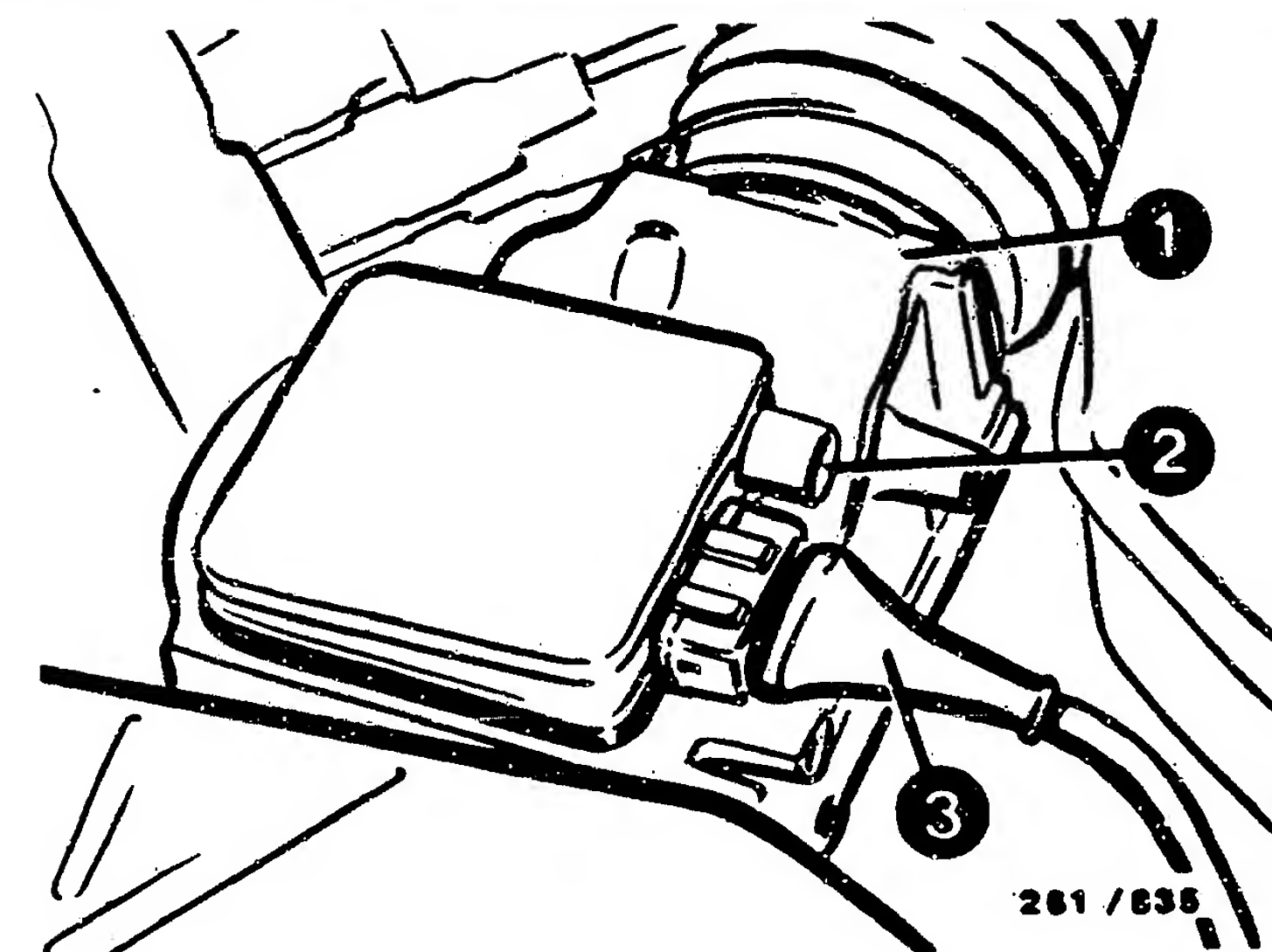
* Use ohmmeter to test for open-
circuit in lead from control unit
term. 9 to air-flow sensor
term. 3. Test plug for corrosion
and loose contact.
It must not be possible to push back
contact.

* Use ohmmeter to test leads from
control unit term. 6 and
term. 9 to air-flow sensor
term. 4 or term. 3 for mutual
short-circuit (contact).
Watch out for worn cable insulation
(insulation damage) and loose con-
tact.

Leads and plug O.K.?

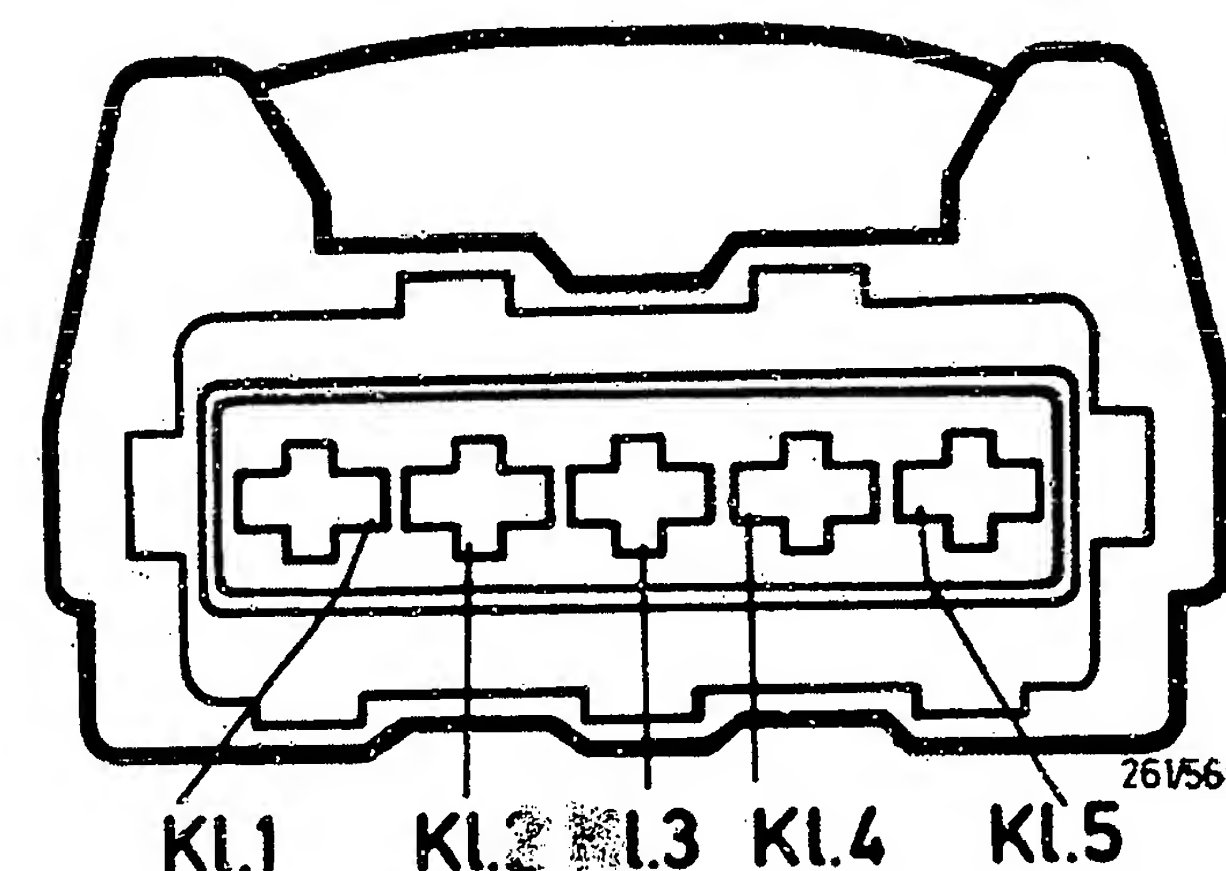
N>

Repair defective lead/plug.



1 = Air-flow sensor
2 = CO potentiometer
3 = Plug of air-flow sensor

Top view of plug for air-
flow sensor



Continued on next picture page

C07

<=>

C08

<=>

2). Voltage too high:

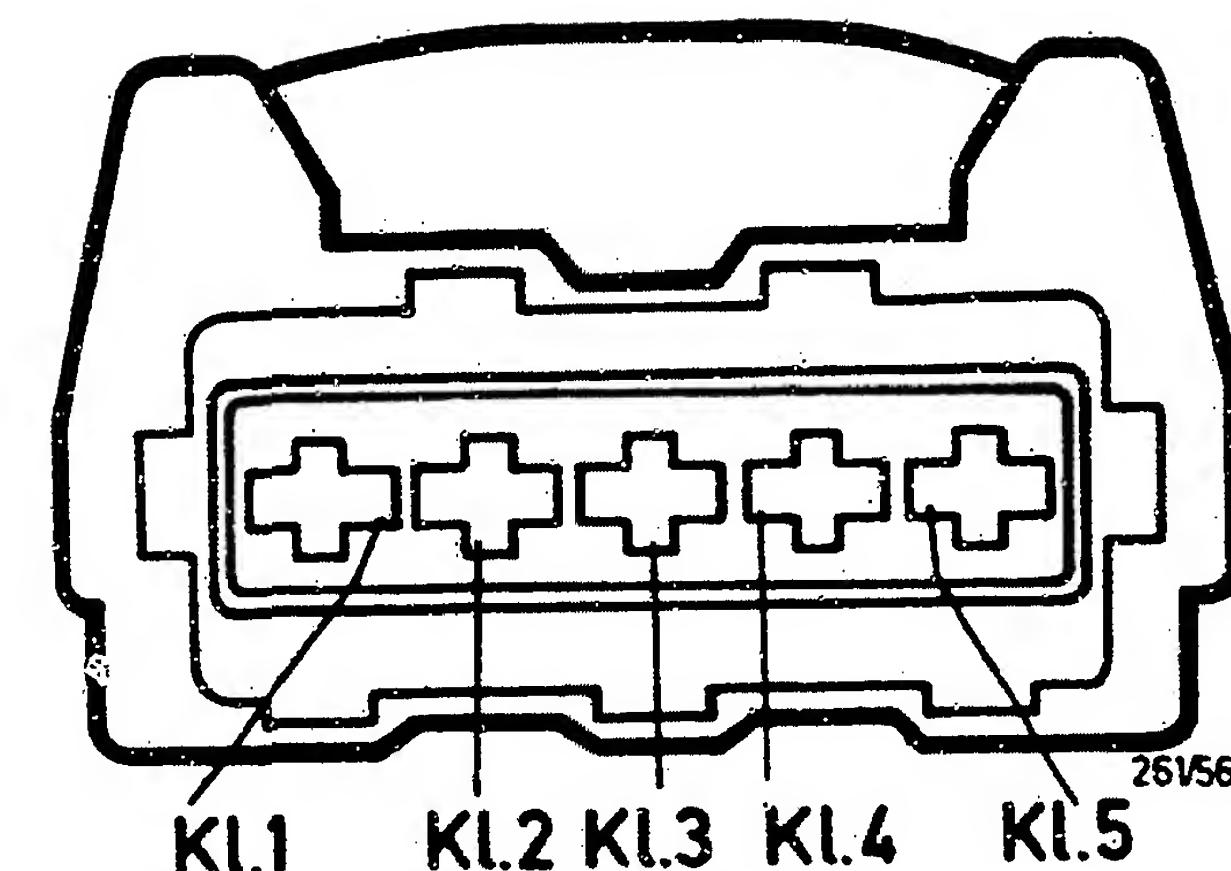
* Use ohmmeter to test for open-circuit in leads from control unit term. 30 and term. 6 to air-flow sensor term. 1 or term. 4. Test plug for corrosion and loose contact. It must not be possible to push back contacts.

* Test lead from control unit term. 30 to air-flow sensor term. 1 for short-circuit (contact) to voltage-carrying lead: Detach plug at air-flow sensor. Switch on ignition. Connect voltmeter to term. 1(+) and term. 4(-) with test prods. If battery voltage applied, establish defect in lead. Watch out for worn cable insulation and loose contact. In the event of a fault, the air-flow sensor may also be defective (subsequent damage).

Leads and plug O.K.?

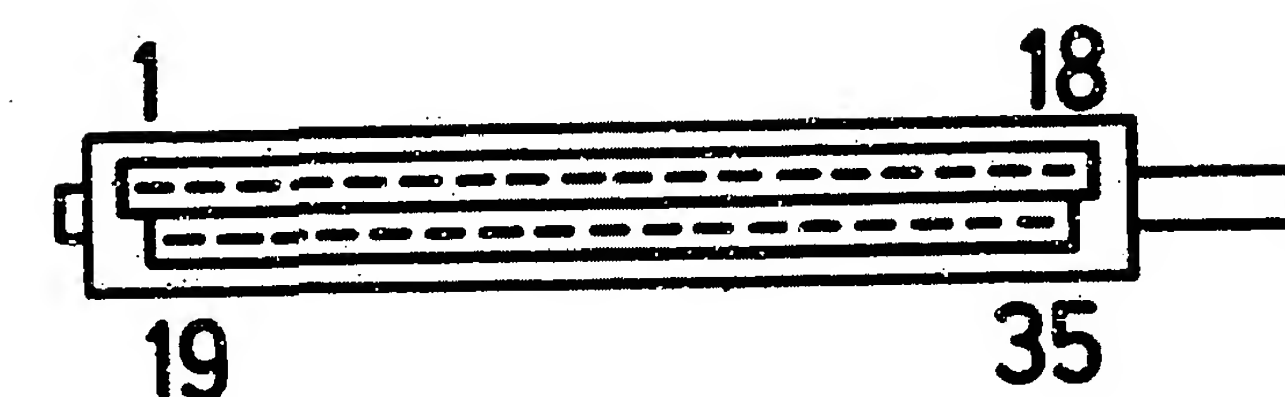
N>

Repair defective lead/plug.



Top view of plug for air-flow sensor

Top view of 35-pin control-unit plug of Motronic wiring harness



Continued on next picture page

261/ 685

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (6) CONTINUED (2)

Test idle potentiometer in air-flow sensor:

Detach plug from air-flow sensor.
Measure resistance values directly at air-flow sensor between term. 1 and term. 4 as well as term. 3 and term. 4:

SET VALUES:

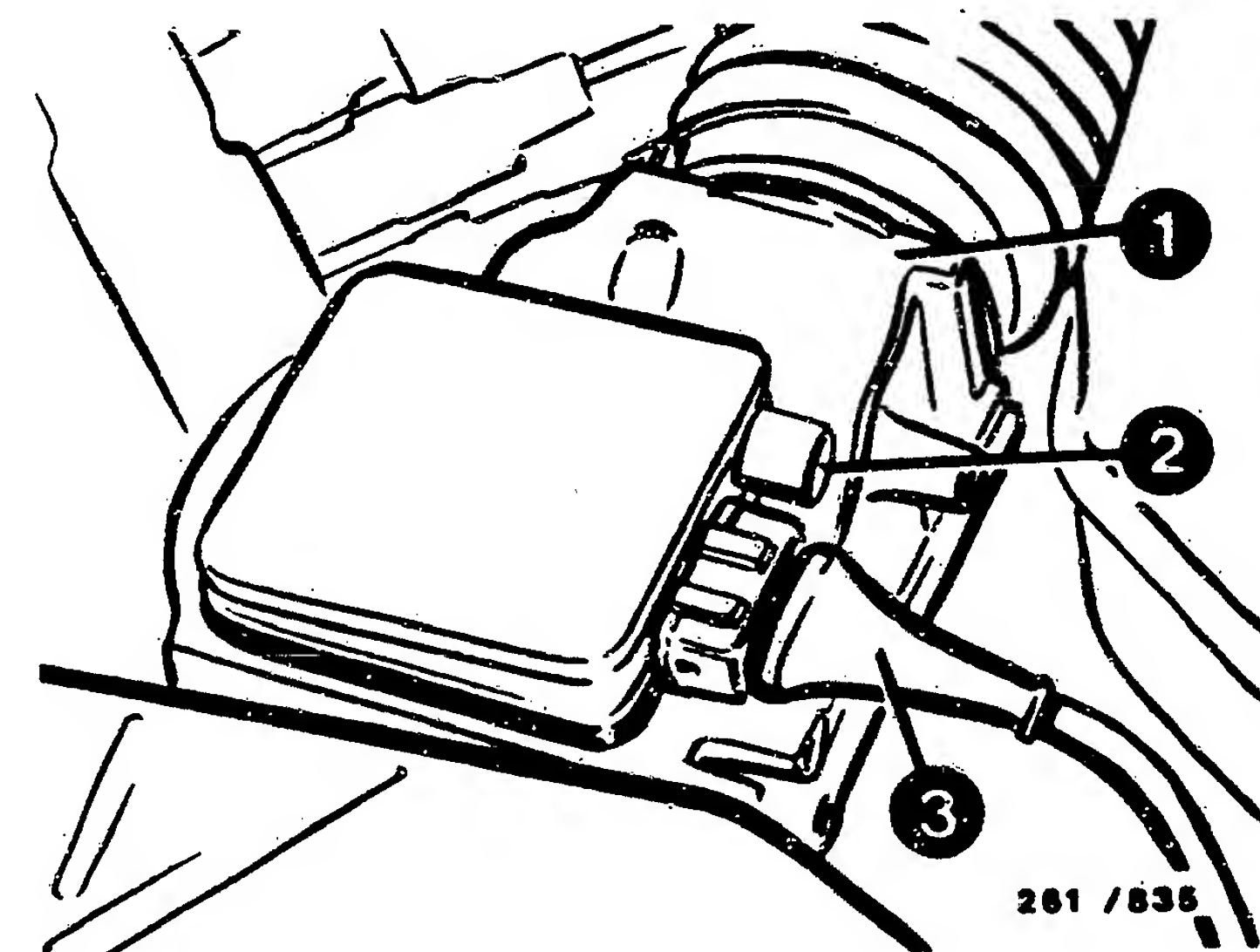
See brief instructions

Note :

Remove cap covering potentiometer adjusting knob and move potentiometer from stop to stop.
Do not leave adjusting knob on stop, otherwise fault is indicated.
The center position is the basic setting. Turning the potentiometer in a clockwise direction increases the duration of injection, whereas turning the potentiometer in a counter-clockwise direction shortens the duration of injection.
Fit new cap.

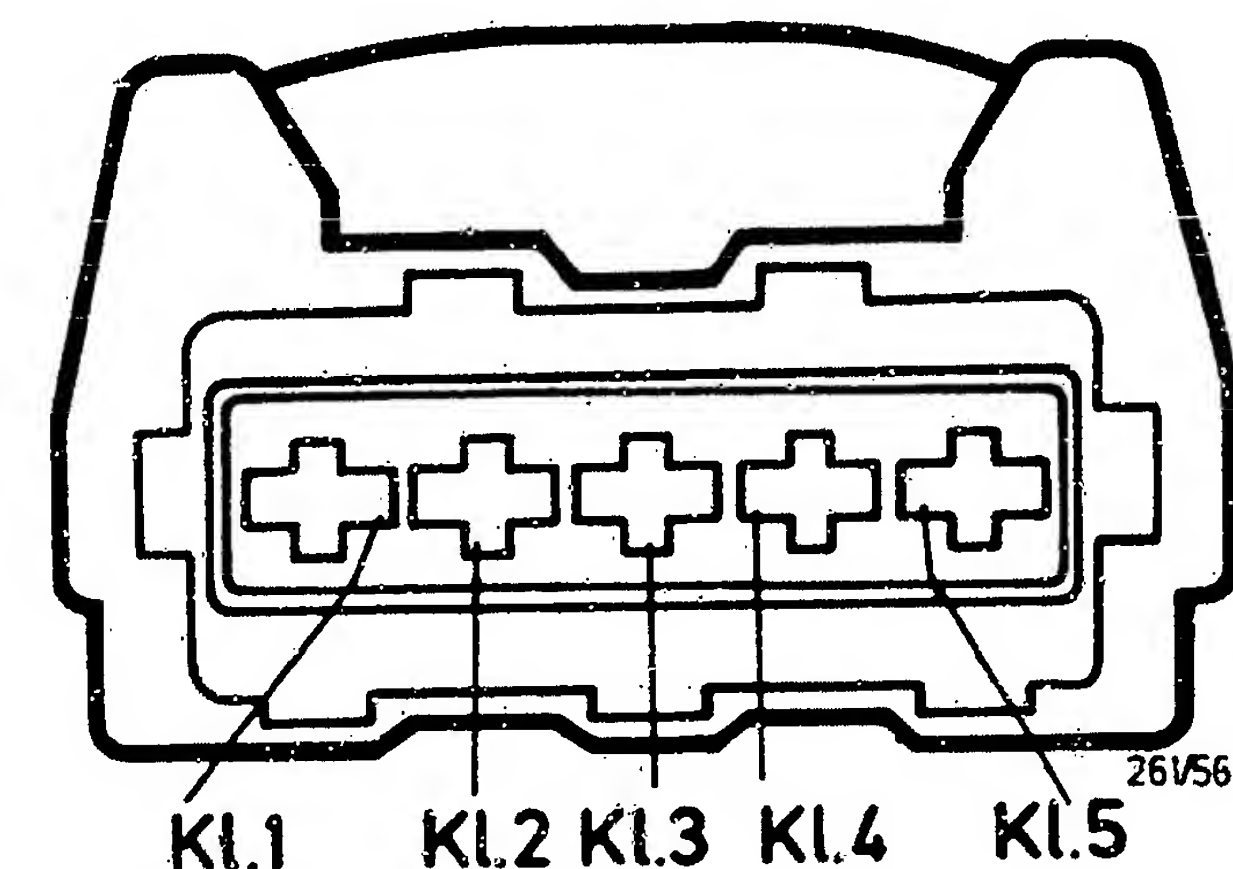
Set values O.K.?

Replace air-flow sensor.



- 1 = Air-flow sensor
- 2 = CO potentiometer
- 3 = Plug of air-flow sensor

Top view of plug for air-flow sensor



Return to self-diagnosis test table B13

C11

<=>

C12

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7)

SELF-DIAGNOSIS
FLASHING CODE 1 2 2 1

N>

Replace air-flow sensor

Check air-flow sensor with
ohmmeter:

Disconnect plug from air-flow
sensor.

Measure resistance values
directly at the plug pins of
the air-flow sensor:

For set values between term. 4
and term. 3 as well as between
term. 4 and term. 2 see
brief instructions.

Set values obtained?

Y
V

Perform visual examination
on plug of air-flow sensor:

N>

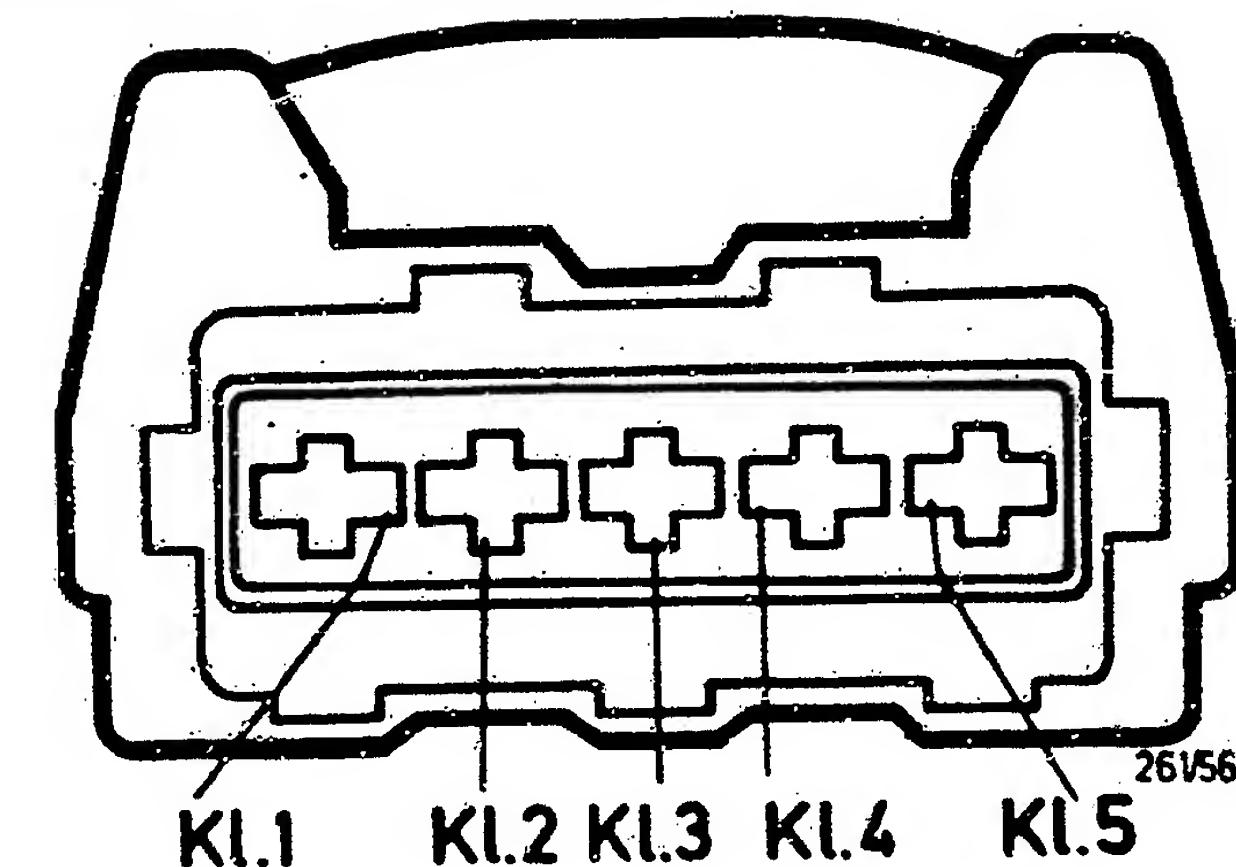
Eliminate defects on plug.
If necessary, replace plug
or spring contacts.

Plug correctly connected,
contacts corroded? Spring
contacts must be latched and
must not allow themselves to
be pushed back.

Plug O.K.?

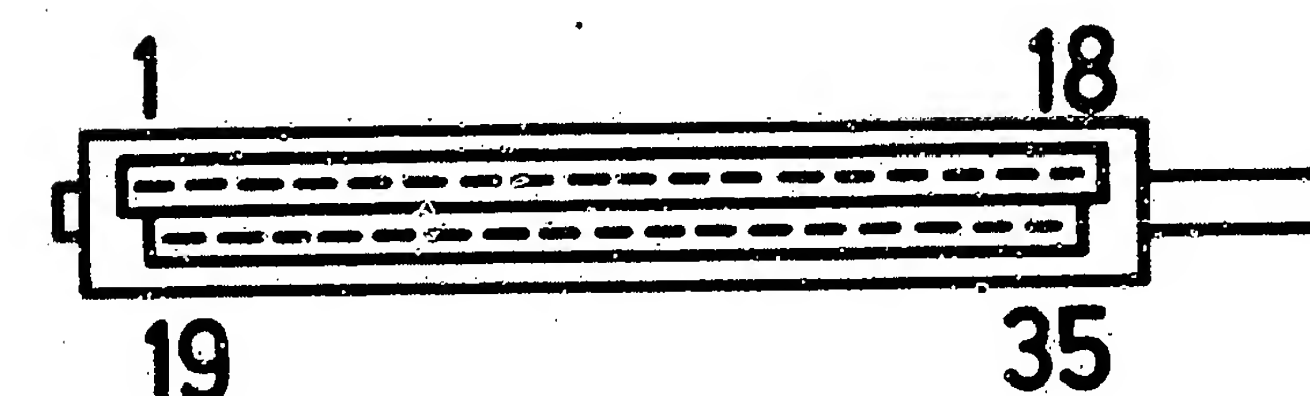
Y
V

Continued on next picture page



Top view of plug for air-
flow sensor

Top view of 35-pin
control-unit plug of
Motronic wiring harness



261/685

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7) CONTINUED (1)

Using ohmmeter, check leads from air-flow sensor to control-unit plug for open circuit and short circuit to ground (insulation damage).

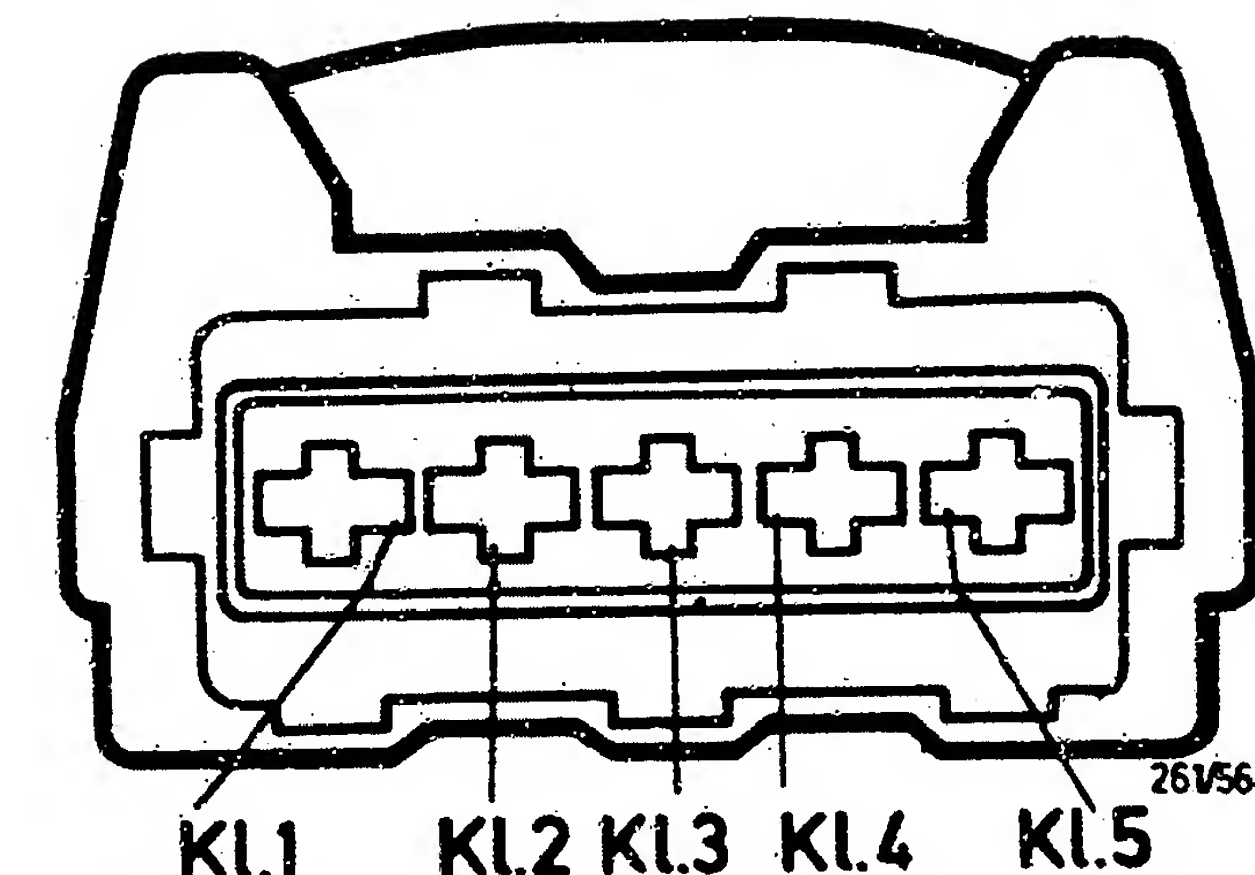
These are the leads from the air-flow sensor term. 2 to control-unit plug term. 7 as well as from term. 3 to term. 9 and from term. 4 to term. 6.

Watch for worn insulation and loose contacts.

Leads O.K.?

N>

Eliminate contact resistances, open circuits or short circuits on leads.



Top view of plug for air-flow sensor

Test leads to control-unit plug term. ■ and term. ■ for faulty mutual connection (short-circuit).

For test purposes, the plug is to be detached from the air-flow sensor.

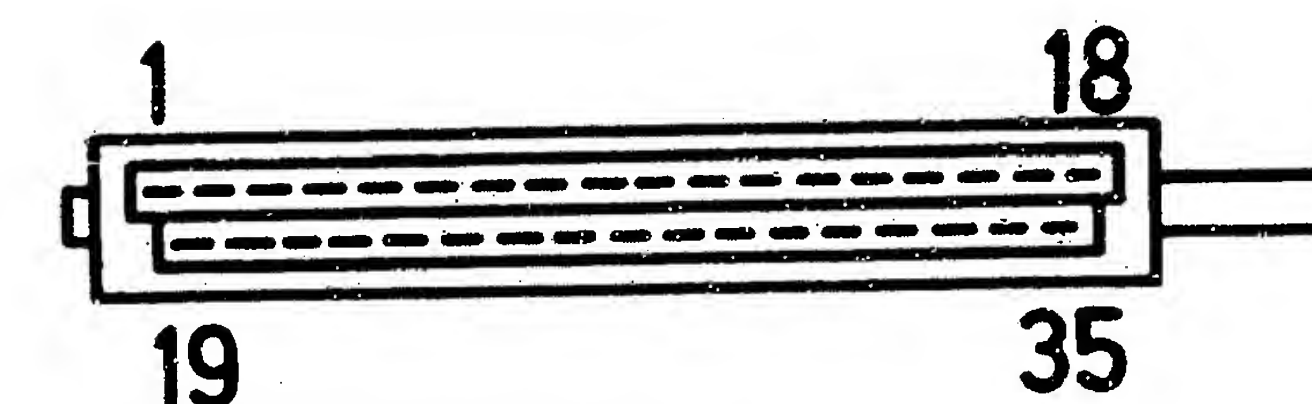
Watch out for worn cable insulation and loose contacts.

Resistance value infinity Ω ?

N>

Eliminate short circuit/insulation damage.

Top view of 35-pin control-unit plug of Motronic wiring harness



Continued on next picture page

261/685

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (7) CONTINUED (2)

V

Additionally test leads from control unit term. 6 and term. 7 to air-flow sensor term. 4 and term. 2 for incorrect connection to positive voltage:

N>

- * Visually examine leads for contact (worn insulation).
- * Air-flow sensor defective.
- * Control unit defective.

Connect plug to air-flow sensor and control unit.

Push back rubber sleeve at plug of air-flow sensor.

Switch on ignition.

Connect voltmeter to ground and consecutively to term. 4 and term. 2 of air-flow sensor.

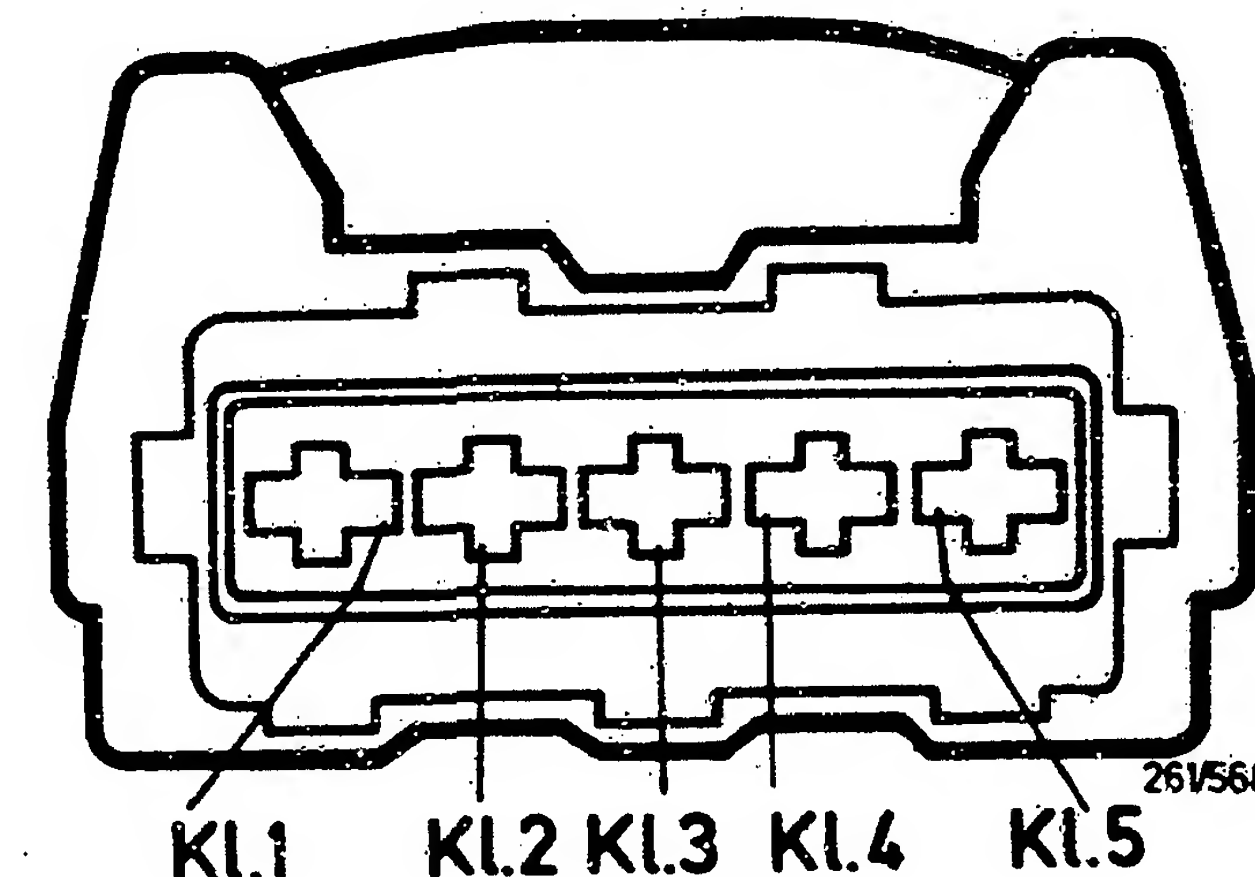
Set values:
at term. 4 no voltage,
at term. 2 less than 4.5 V

Are set values attained?

Y

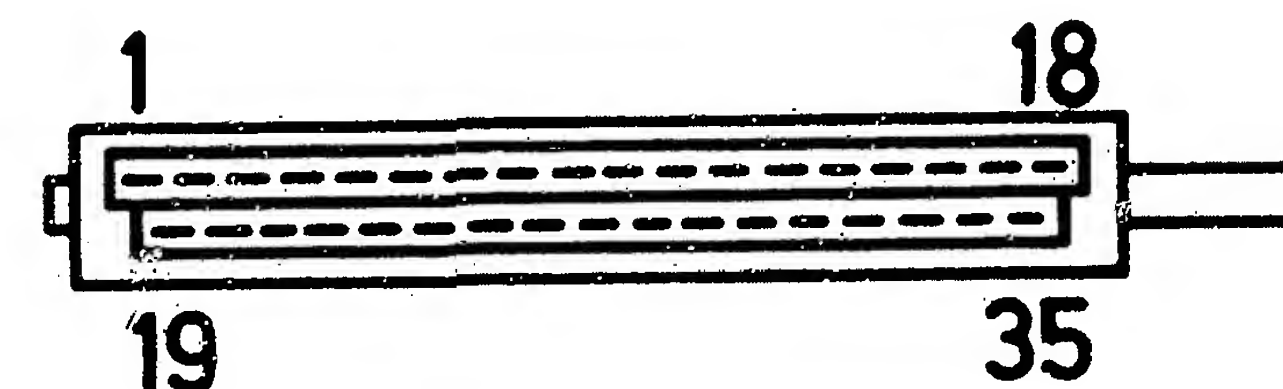
V

Return to self-diagnosis
test table B15



Top view of plug for air-flow sensor

Top view of 35-pin control-unit plug of Motronic wiring harness



261/685

C17

<=>

C18

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8)

SELF-DIAGNOSIS FLASHING CODE 1 2 2 2

Test idle actuator.

*Measure winding resistance directly
at idle actuator:

SET VALUE:

See brief instructions

*Test for continuity in leads from
control unit term. 33 to idle
actuator and from other terminal
of idle actuator to main relay
term. 87(+).

Test plug for corrosion and loose
contact.

It must not be possible to push
back contacts.

*Slider of idle actuator must
neither stick nor catch.

Winding resistance, leads and
slider O.K.?

N>

*Winding resistance not within
tolerance:

Replace idle actuator.

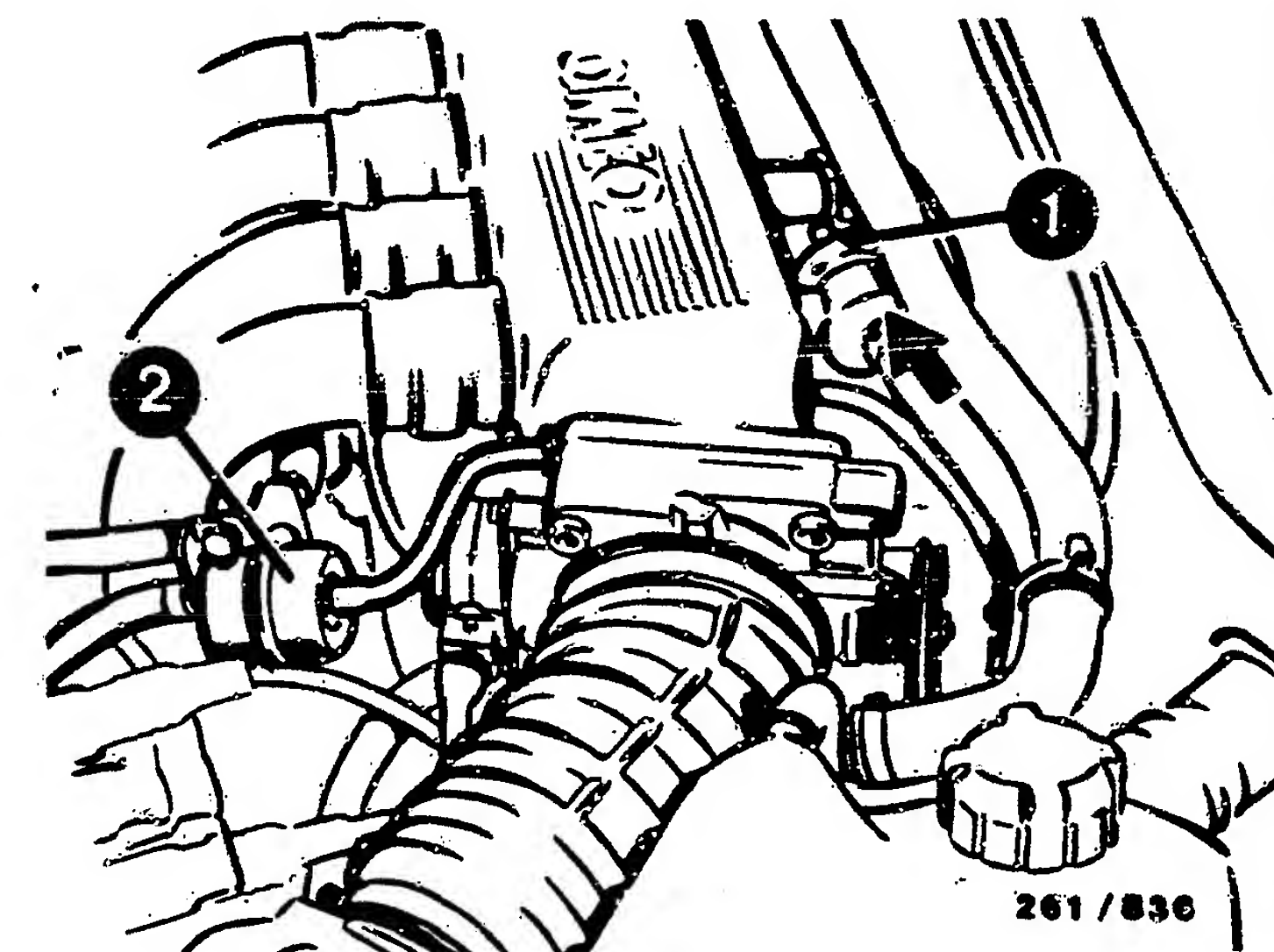
Note direction of flow.

*Repair leads and plug-in
connection.

*Slide mechanically damaged:

Replace idle actuator.

Note direction of flow.



Alfa 164 3.0 V6:

1 = Idle actuator

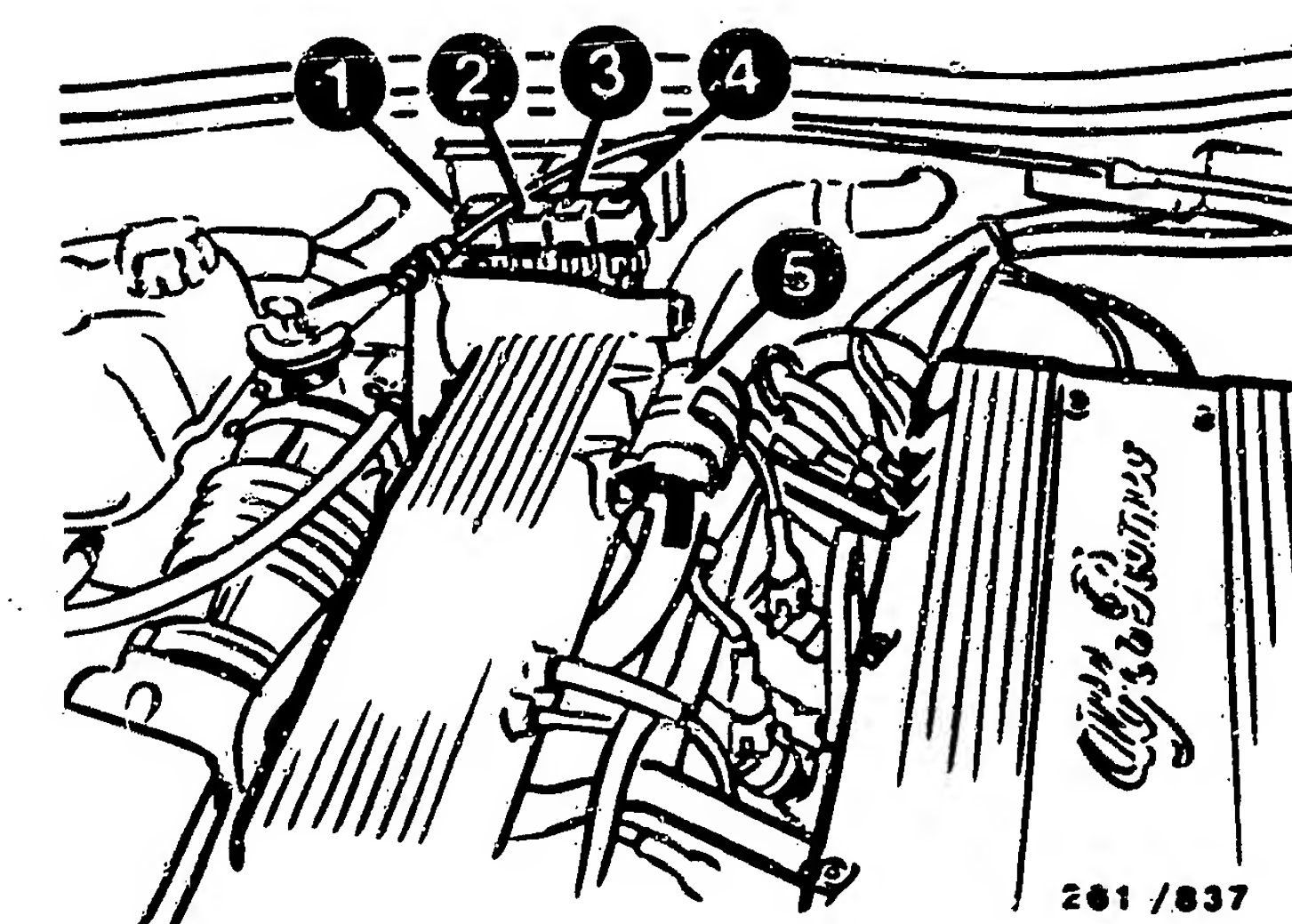
2 = Fuel pressure regulator

Arrow = Direction of flow

Alfa 75 Twin Spark S:

5 = Idle actuator

Arrow = Direction of flow



Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (8) CONTINUED (1)

Check energization of idle actuator.

Switch on ignition.
Idle actuator is pulsed by the control unit and vibrates (feel by hand).

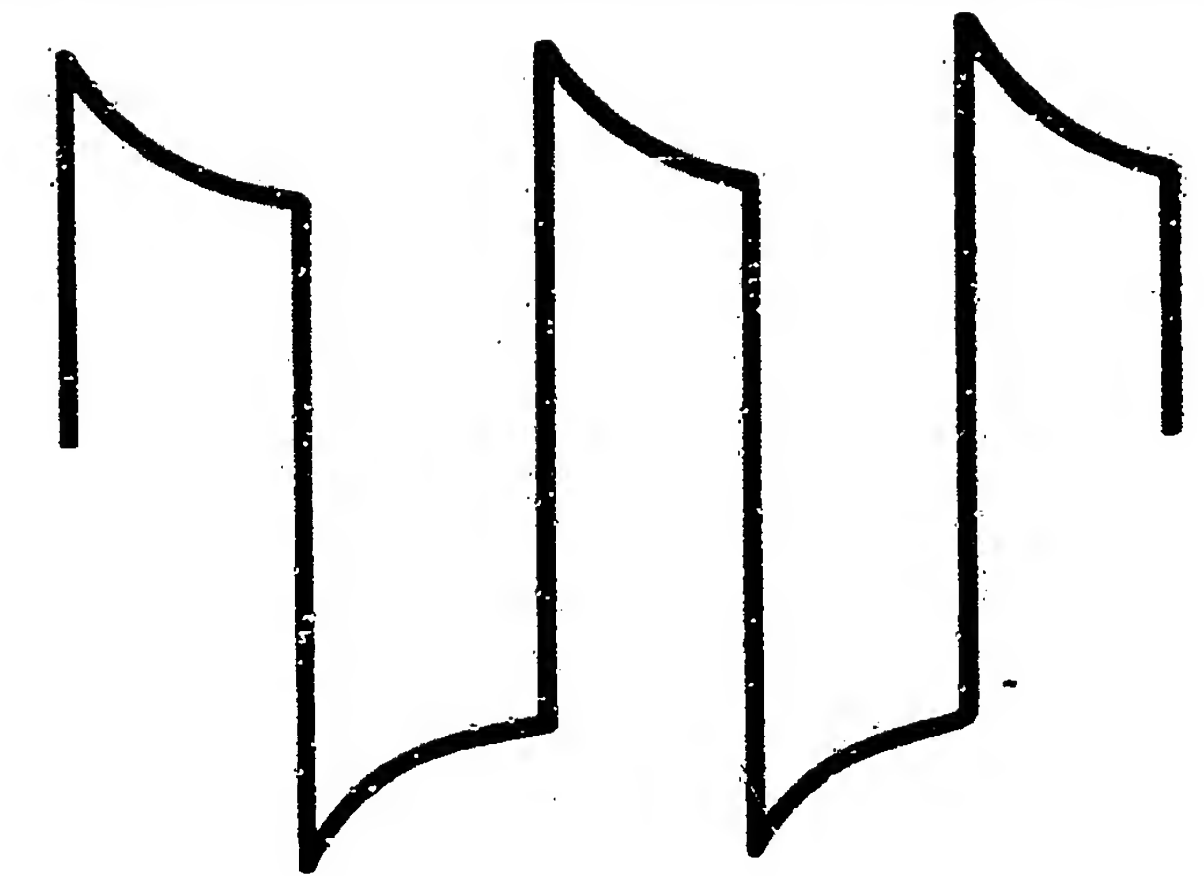
Idle actuator vibrating?

N>

Measure signal at idle actuator:

Connect two-pole test lead 1 684 463 093 between actuator and its connector.
Connect motortester (special input) to test lead:
Black clamp to vehicle ground, red clamp to test lead term. 33 (try out which connection leads to term. 33).
Insulate bare terminals and lay to one side.
Switch on ignition.
If correctly connected, signals will be visible on the oscilloscope (top picture).

If no signals visible, replace control unit.



261/0259

Signals at idle actuator

Return to self-diagnosis test table B15

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (9)

SELF-DIAGNOSIS FLASHING CODE

1 2 2 3

Lambda closed-loop control on rich or lean stop.

Possible sources of fault:

- Leak in air intake system or exhaust system
- Fuel pressure/delivery not within tolerance
- Defective injection valves
- Extreme incorrect setting of idle-mixture-adjusting screw
- Air-flow sensor defective
- Tank ventilation defective
- Fuel tank emptied

Indicated items O.K.?

N>

Measure CO content ahead of catalytic converter (engine and catalytic converter at operating temperature):

Set value: see brief instructions

* If mixture too lean:

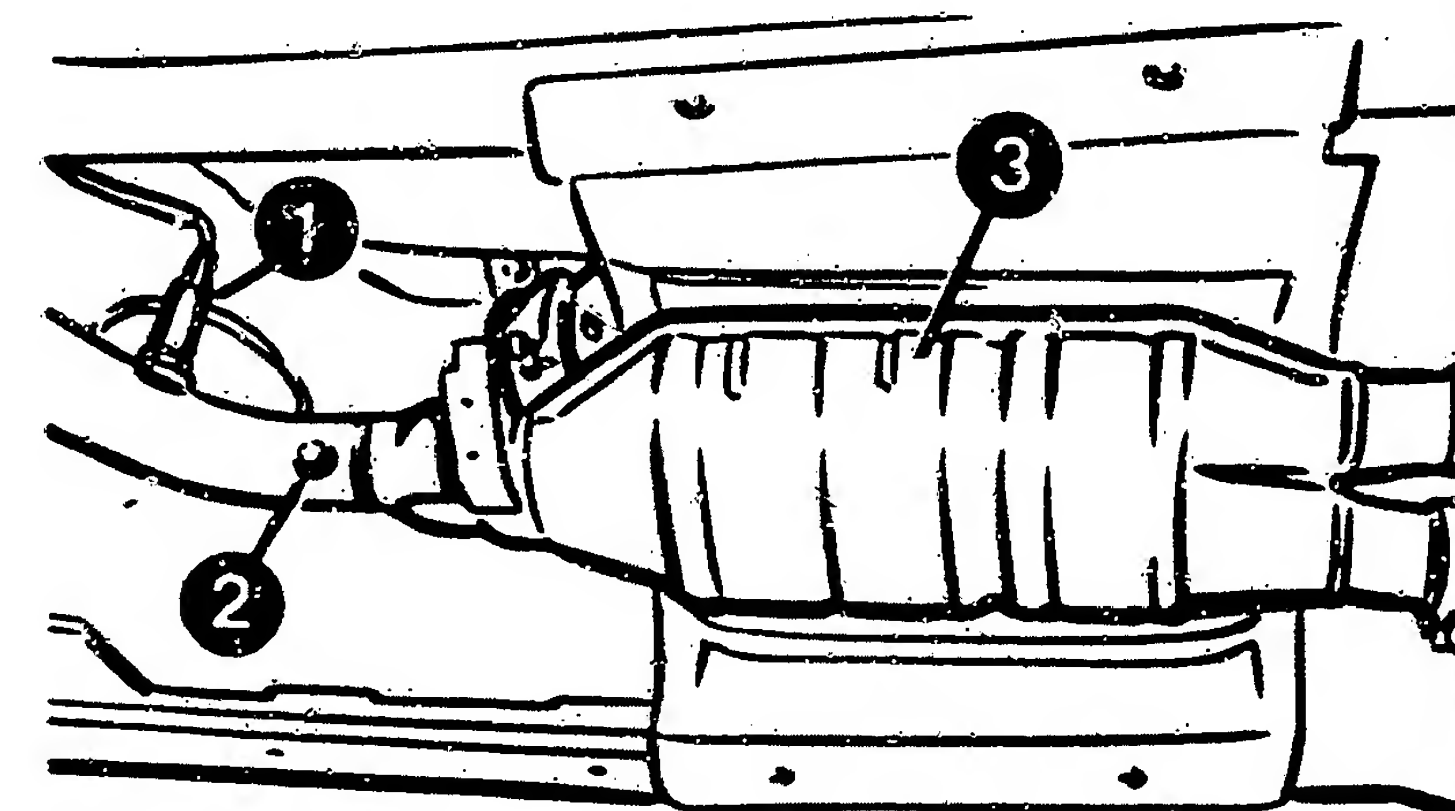
- Test air intake system for leaks. Eliminate leaks by using new seals or by tightening tie bands.
- Deposits on injection valves
- Fuel pressure/delivery of electric fuel pump too low. See brief instructions for set values.
- Extreme incorrect setting of idle-mixture-adjusting screw.
- Test air-flow sensor.

* If mixture too rich:

- Fuel pressure too high
- Injection valves defective (leak)
- Extreme incorrect setting of idle-mixture-adjusting screw.
- Tank ventilation valve defective.
- Test air-flow sensor.
- Leak in exhaust system.

N o t e :

In spite of a correct CO content when idling, mixture deviations in other engine operating statuses can cause the lambda closed-loop control to reach the stop.



281/838

Alfa 75 Twin Spark S

1 = Lambda sensor

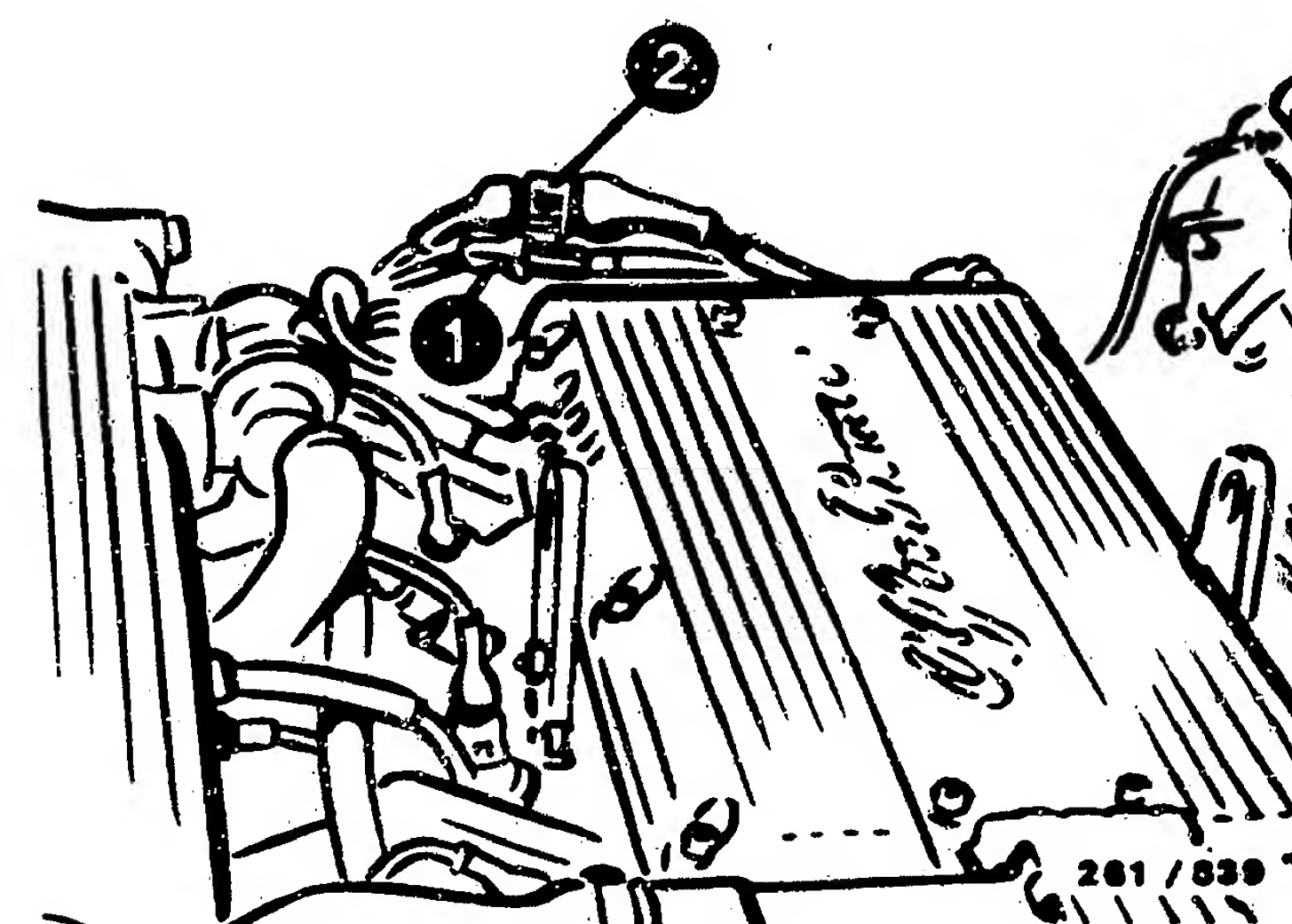
2 = CO sampling point ahead of catalytic converter

3 = Catalytic converter

Alfa 75 Twin Spark S

1 = Plug connection for lambda-sensor signal

2 = Plug connection for sensor heater



281/838

Return to self-diagnosis test table B15

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10)

SELF-DIAGNOSIS FLASHING CODE

1 2 2 4

Lambda sensor malfunction.

* Use ohmmeter to test for open-circuit in lead from control unit term. 24 to lambda sensor.
Test plug for corrosion and loose contact.

It must not be possible to push back contacts.
Test sensor heater.

* Use ohmmeter to test lead from control unit term. 24 to lambda sensor for short-circuit (contact) to ground.

Watch out for worn cable insulation (insulation damage) and loose contact.

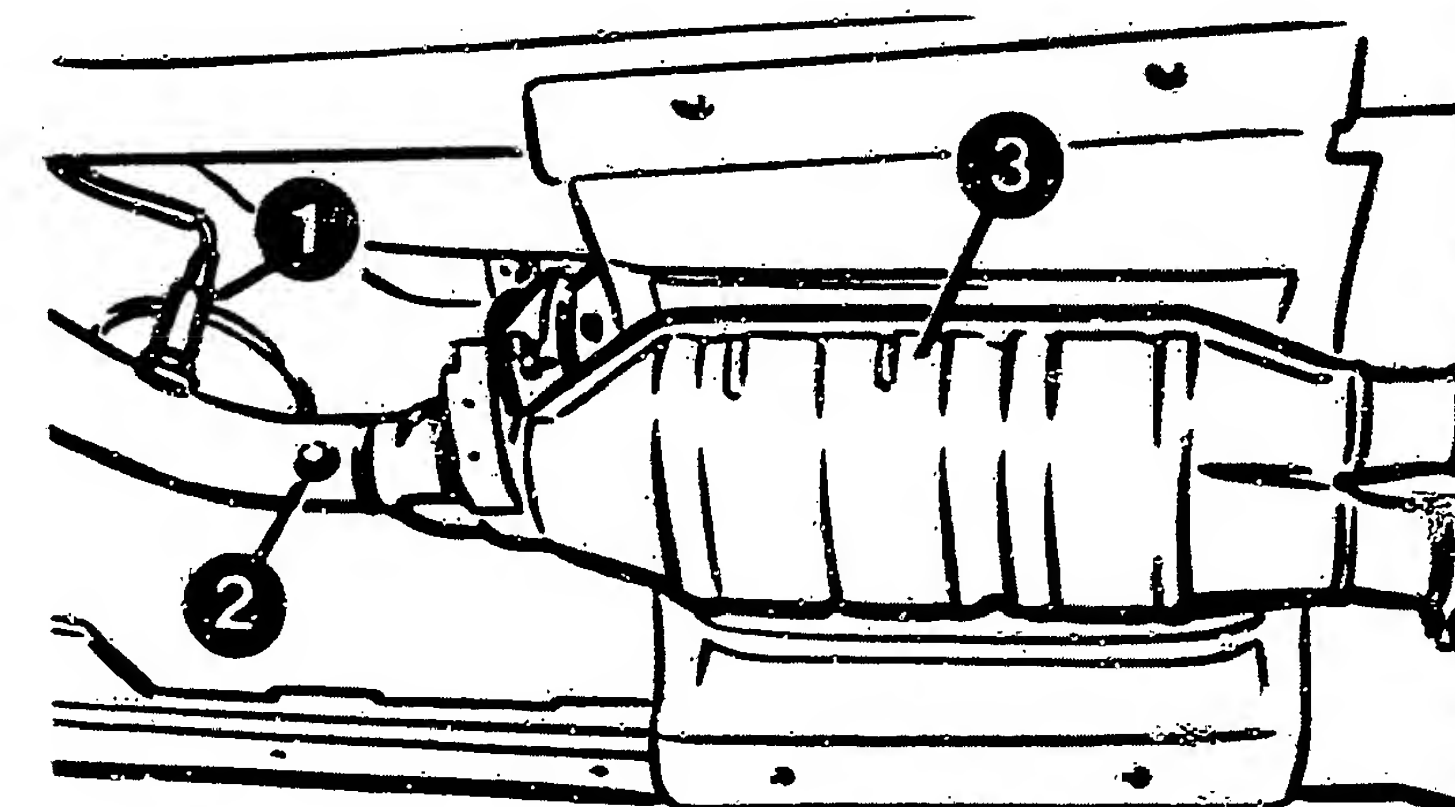
* Lead from control unit term. 24 to lambda sensor has connection to voltage-carrying lead (short-circuit to battery voltage due to damaged insulation).

Watch out for worn cable insulation and loose contact.

Leads and plug O.K.?

N>

Repair defective lead/plug.



261/05E

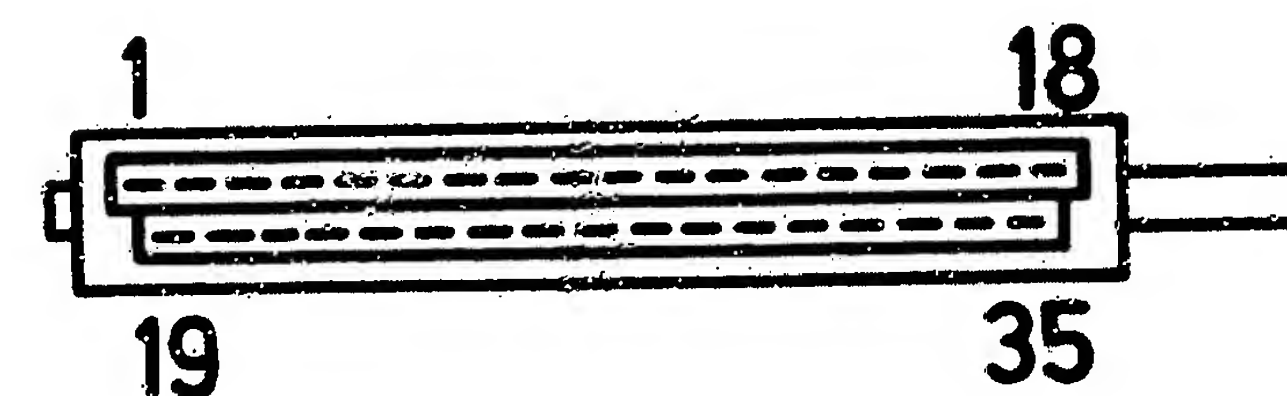
Alfa 75 Twin Spark S

1 = Lambda sensor

2 = CO sampling point ahead of catalytic converter

3 = Catalytic converter

Top view of 35-pin control-unit plug of Motronic wiring harness



261/685

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (10) CONTINUED (1)

Replace lambda sensor.

Clear fault memory, perform test drive and interrogate self-diagnosis again.

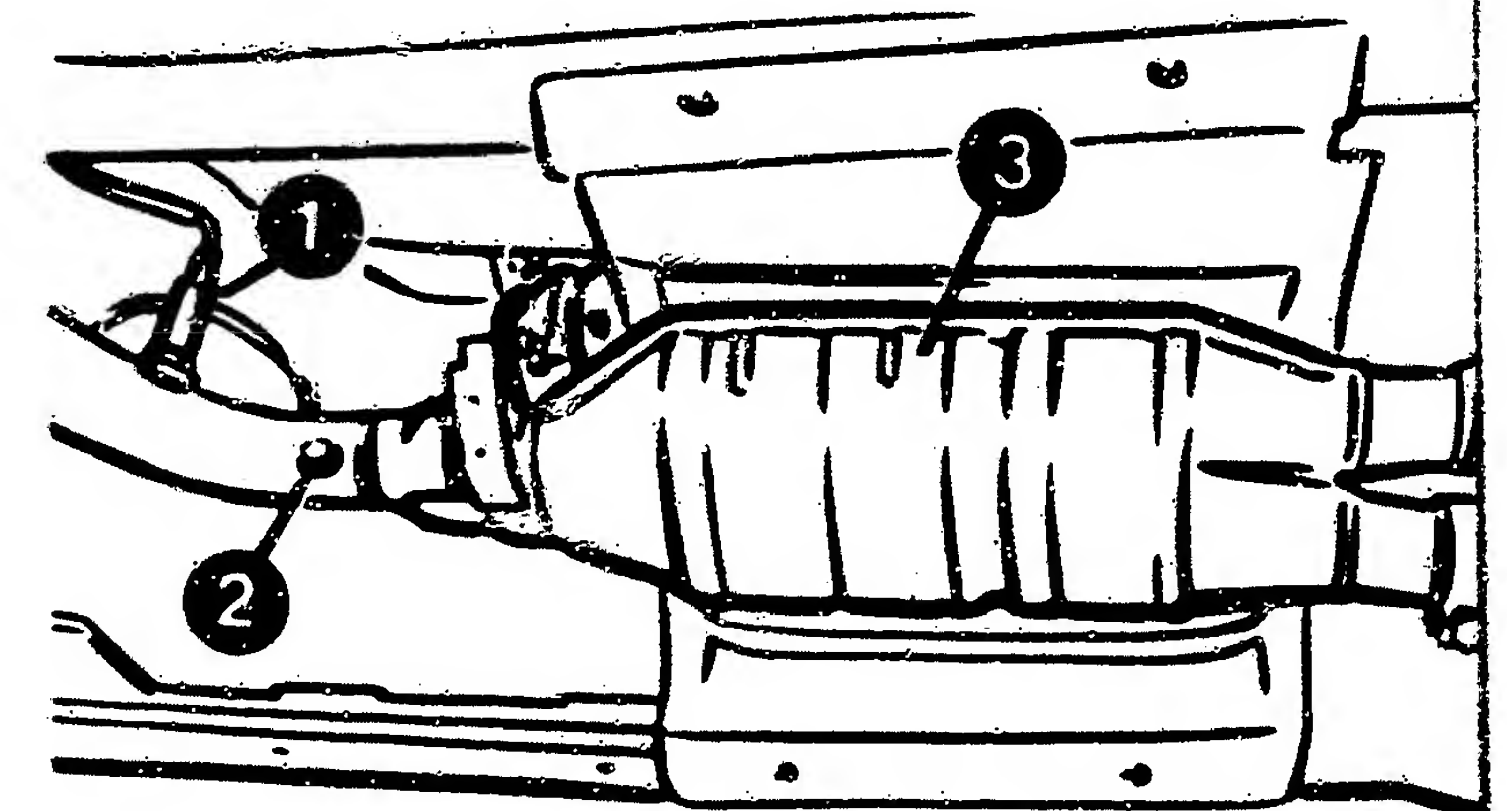
Is fault 1224 no longer present?

N>

Replace control unit

Y

Return to self-diagnosis test table B15



201/838

Alfa 75 Twin Spark S

1 = Lambda sensor

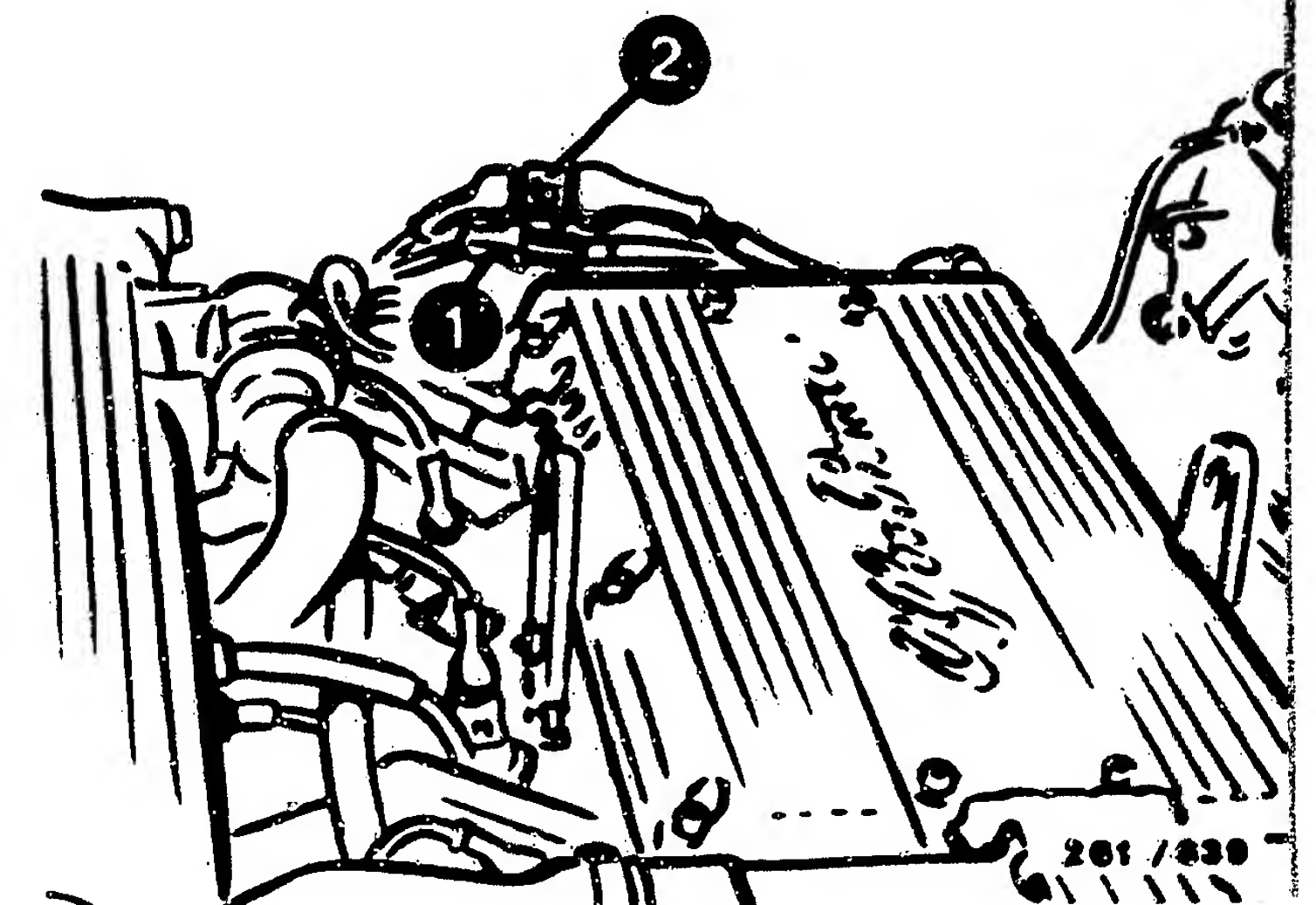
2 = CO sampling point ahead of catalytic converter

3 = Catalytic converter

Alfa 75 Twin Spark S

1 = Plug connection for lambda-sensor signal

2 = Plug connection for sensor heater



201/839

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11)

SELF-DIAGNOSIS
FLASHING CODE 1 2 2 5

Check temperature sensor (air)
in air-flow sensor:

Disconnect plug from air-flow
sensor.

Check resistance directly at
air-flow sensor between
term. 4 and term. 5:

Set value:
see brief instructions

Set value obtained?

N>

Replace air-flow sensor.

Y

Perform visual examination on
plug of air-flow sensor term. 4
and term. 5:

Plug correctly connected,
contacts corroded? Spring
contacts must be latched and
must not allow themselves
to be pushed back.

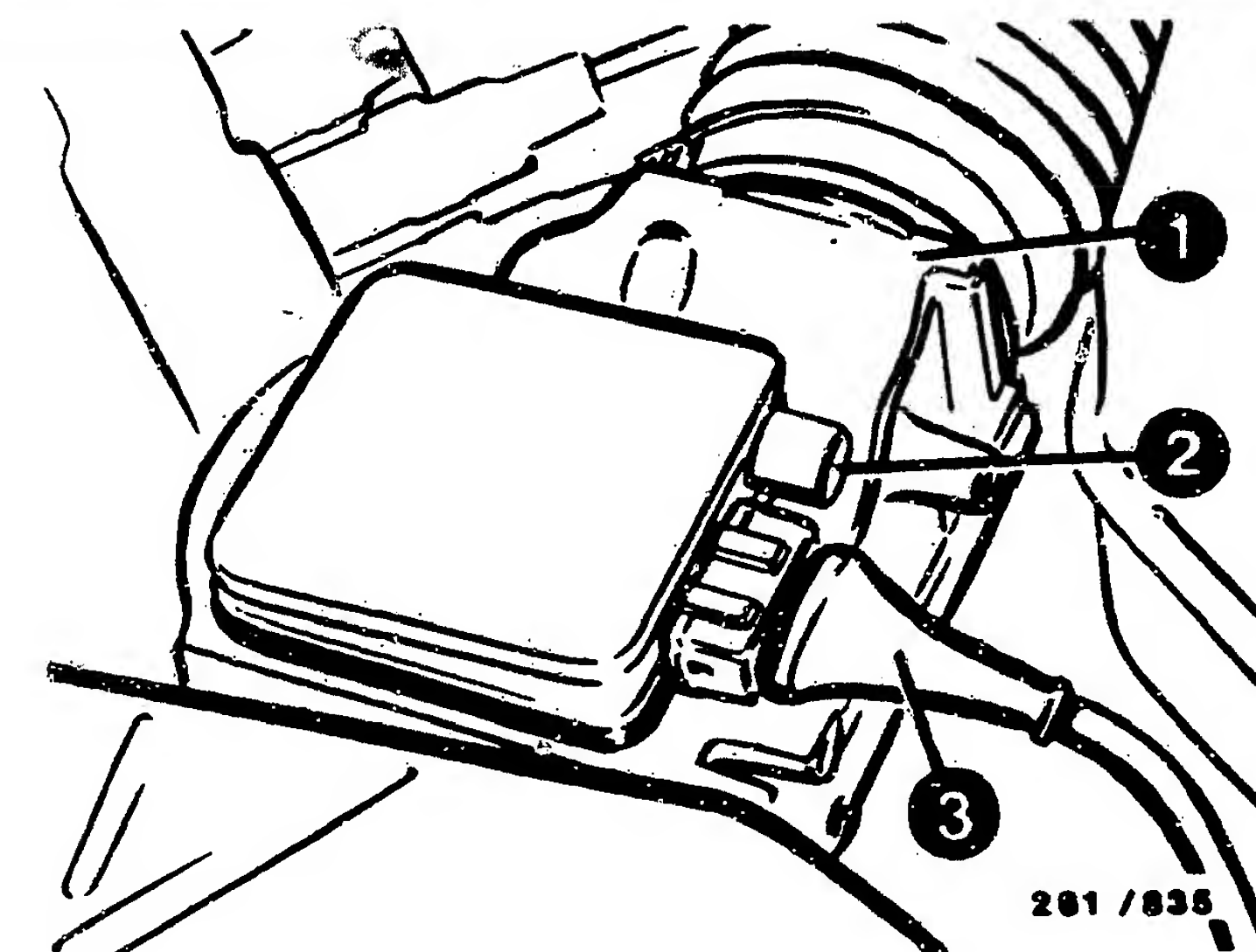
Plug O.K.?

N>

Eliminate defects on plug.
If necessary, replace plug
or spring contacts.

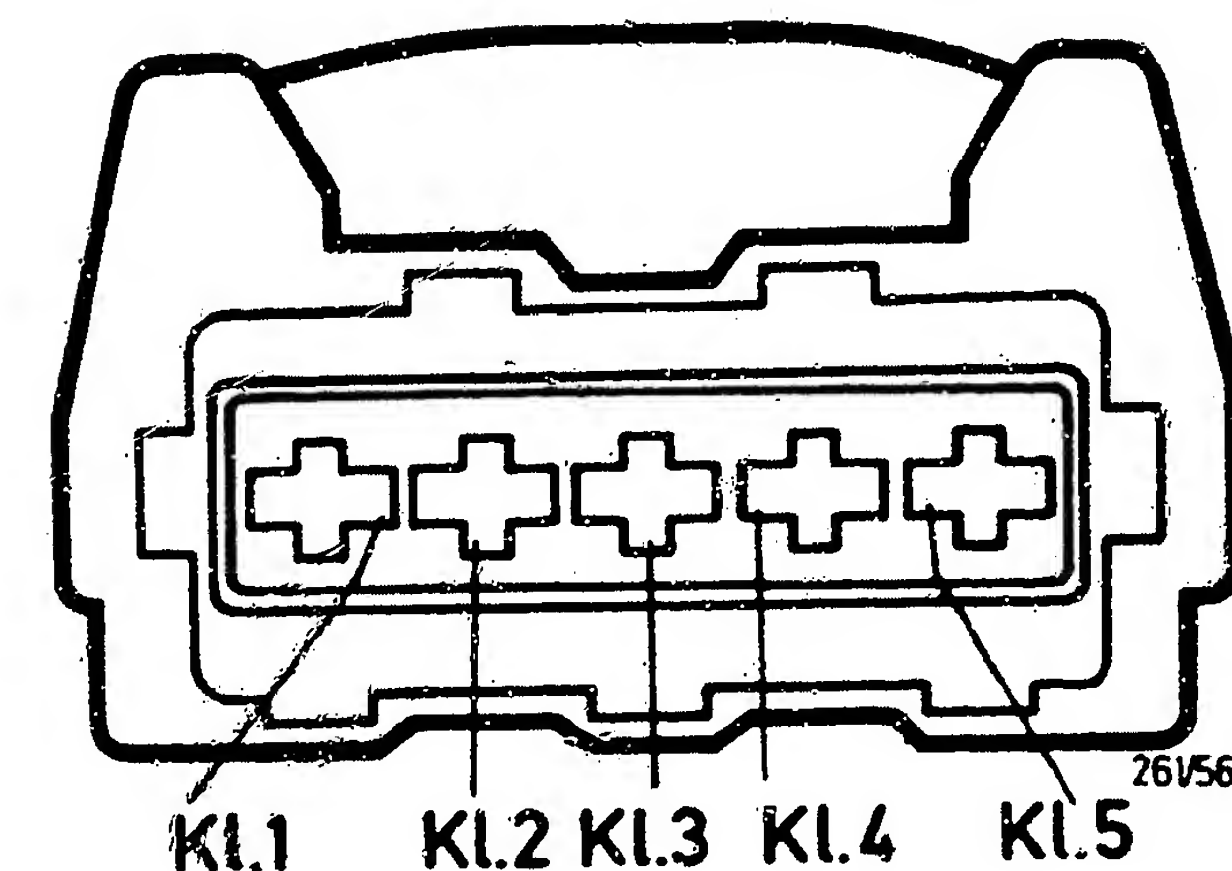
Y

Continued on next picture page



- 1 = Air-flow sensor
- 2 = CO potentiometer
- 3 = Plug of air-flow sensor

Top view of plug for air-flow sensor



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (11) CONTINUED (1)

V

Using ohmmeter, check leads to temperature sensor in air-flow sensor for open circuit and short circuit. From air-flow sensor plug term. 4 and term. 5 to control-unit plug term. 6 and term. 22

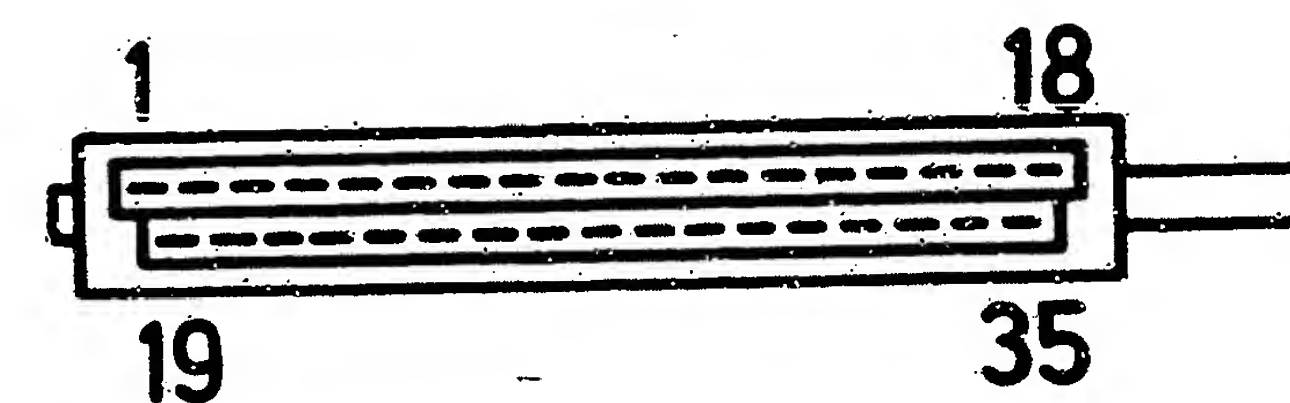
Leads O.K.?

N>

Eliminate contact resistances, open circuits or short circuits on leads.

Y

Return to self-diagnosis test table B15



261/ 685

Top view of 35-pin control-unit plug of Motronic wiring harness

D03

<=>

D04

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (12)

SELF-DIAGNOSIS FLASHING CODE

1 2 4 3

Fault in fuel-pump-relay current path.

Trouble-shooting procedure:

*Detach fuel pump relay and measure resistance of relay coil (term. 86 with respect to term. 85 at relay).

SET VALUE: See brief instructions

*Measure voltage at term. 86 in relay frame with respect to vehicle ground with ignition switched on.

SET VALUE: Battery voltage

Ignition off, detach control unit:

*Test for continuity in actuation lead of fuel pump relay (term. 85 in relay frame to term. 20 in control-unit plug) (approx. 0 Ω). It must not be possible to push back spring contacts in control-unit plug.

*Test same lead for short-circuit to ground and battery voltage (approx. infinity Ω must be measured between term. 85 and all other connections in relay frame as well as vehicle ground).

Note: Watch out for worn cable insulation!

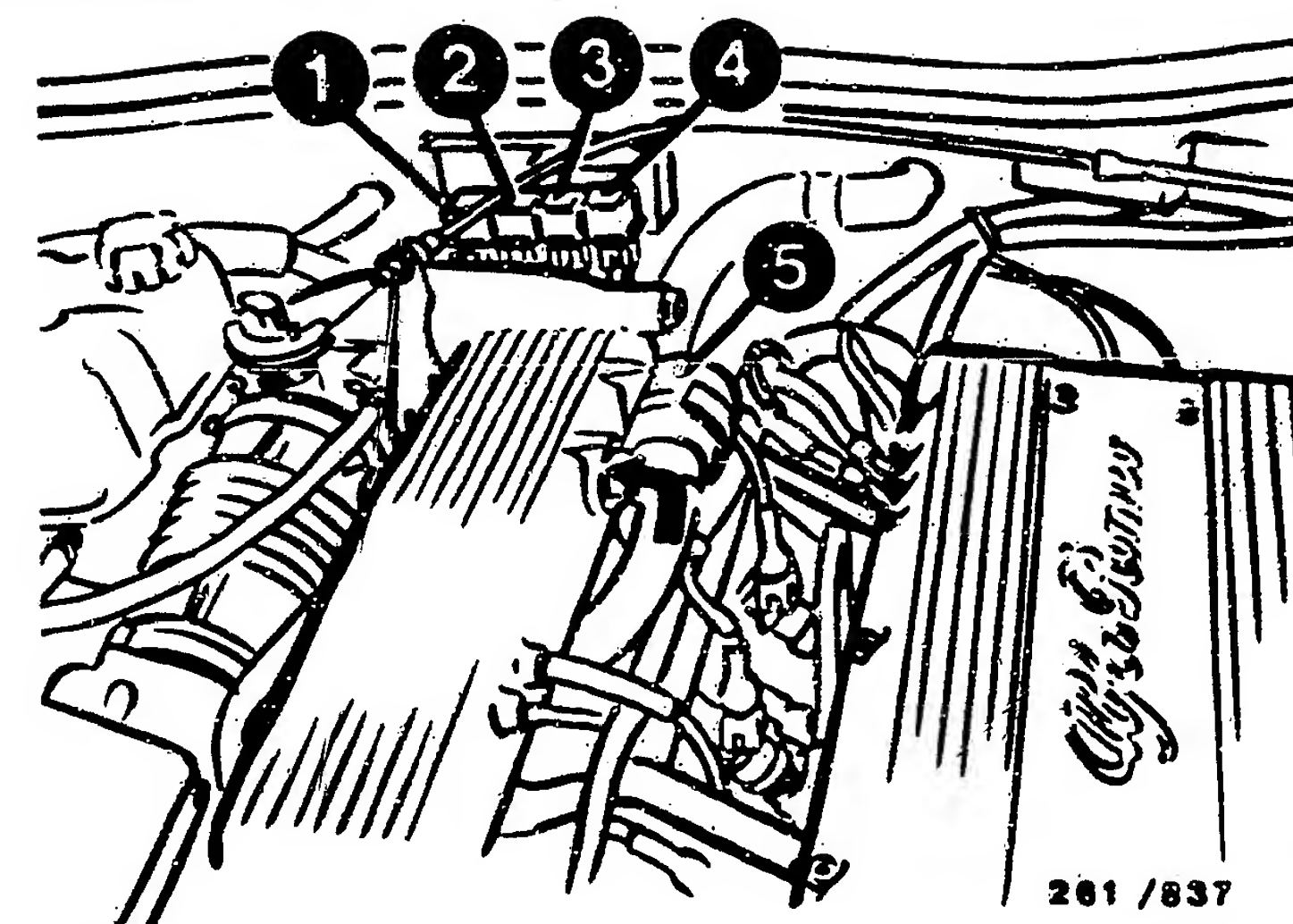
All tests O.K.?

N>

*Renew fuel pump relay if resistance of relay coil is not within tolerance.

*If no voltage at term. 86 with ignition switched on, test for continuity in lead to main relay term. 87.

*If actuation lead of fuel pump relay and spring contacts in control-unit plug O.K., it must be assumed that output stage is defective.
Renew control unit.



Alfa 75 Twin Spark S:

1 = Fuel pump relay

2 = Main relay

(with red mark)

3 = Relay for camshaft switching

4 = Relief relay

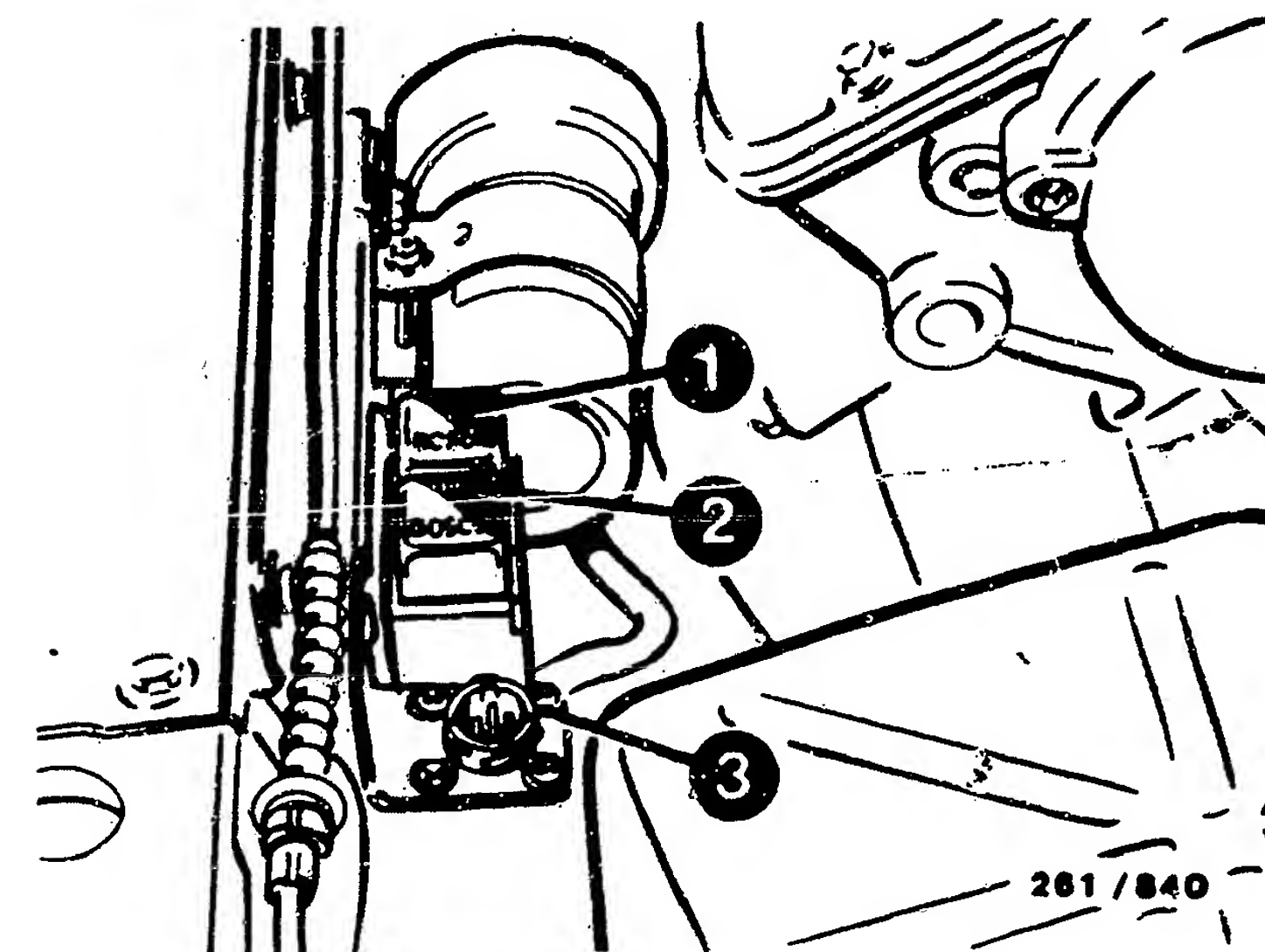
Alfa 164 3.0 V6

1 = Fuel pump relay

2 = Main relay

(with red mark)

3 = Self-diagnosis socket



Return to self-diagnosis test table B17

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (13)

SELF-DIAGNOSIS FLASHING CODE

1 2 4 4

Fault in current circuit of tank-ventilation switching valve (TES)

Trouble-shooting procedure:

1. Detach plug from TES.
Test internal resistance.
SET VALUE: See brief instructions
If set value is not obtained, renew TES; otherwise continue testing with 2.
2. Test actuation of TES.
Use test prods to measure voltage directly at valve.
No voltage must be applied with ignition switched off and when idling with idle contact closed. In part-load range (accelerate powerfully) battery voltage.
Note:
The TES always remains closed when the engine is cold (coolant temperature less than 60°C).

Internal resistance and actuation of tank-ventilation switching valve O.K.?

N>

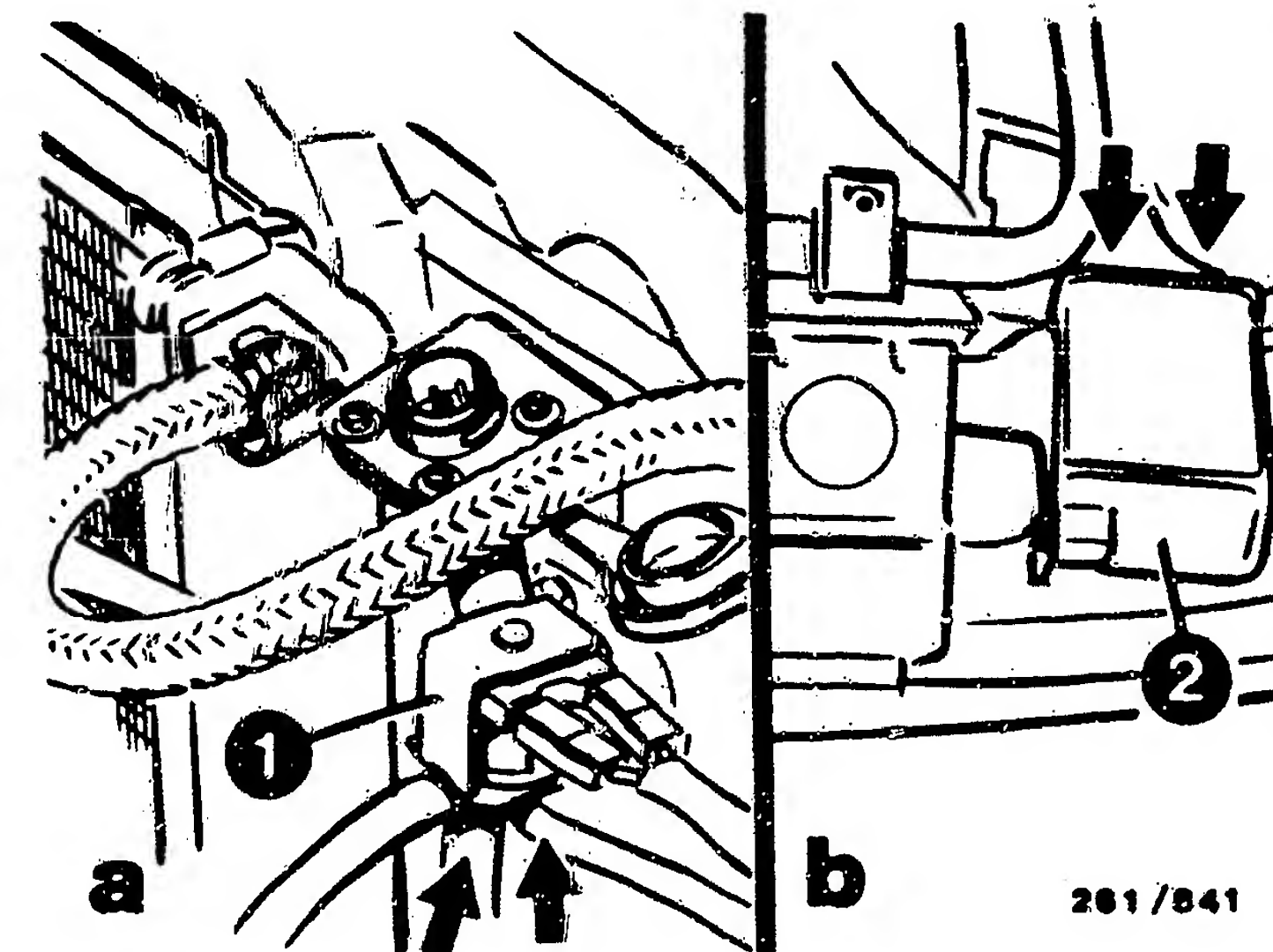
*Renew tank-ventilation switching valve if internal resistance not within tolerance.

*If no voltage at valve with part load:

- Battery voltage must be applied at one of the two TES leads with the ignition switched on; otherwise proceed with trouble-shooting as per terminal diagram.
- Test the second lead (actuation lead) for continuity (approx. 0 Ω) with respect to term. 34 in control-unit plug and short-circuit to battery voltage.
Spring contact no. 34 in control-unit plug O.K.?

* If voltage is applied to TES with ignition switched on or when idling, test actuation lead for short-circuit to ground.

If leads O.K., output stage is defective.
Renew control unit.



Alfa 75 Twin Spark S:

- 1 = Tank-ventilation switching valve (not from Bosch)
- 2 = Active-carbon container (beneath vehicle, in front of right-hand, front wheel house)

Arrows = Bleeder hoses

Return to self-diagnosis test table B17

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (14)

SELF-DIAGNOSIS FLASHING CODE

1 2 4 5

Fault in current circuit of camshaft switching.

Trouble-shooting procedure:

*Detach relay for camshaft switching and measure resistance of relay coil (term. 86 with respect to term. 85 at relay).

SET VALUE: See brief instructions

*Measure voltage at term. 86 in relay frame with respect to vehicle ground with ignition switched on.

SET VALUE: Battery voltage

Ignition off, detach control unit:

*Test for continuity in actuation lead of relay for camshaft switching (term. 85 in relay frame with respect to term. 31 in control-unit plug) (approx. 0 Ω).

It must not be possible to push back spring contact in control-unit plug.

*Test same lead for short-circuit to ground/battery voltage (Approx. infinity Ω must be measured between term. 85 and all other connections in relay frame as well as vehicle ground).

Note: Watch out for worn cable insulation!

All tests O.K.?

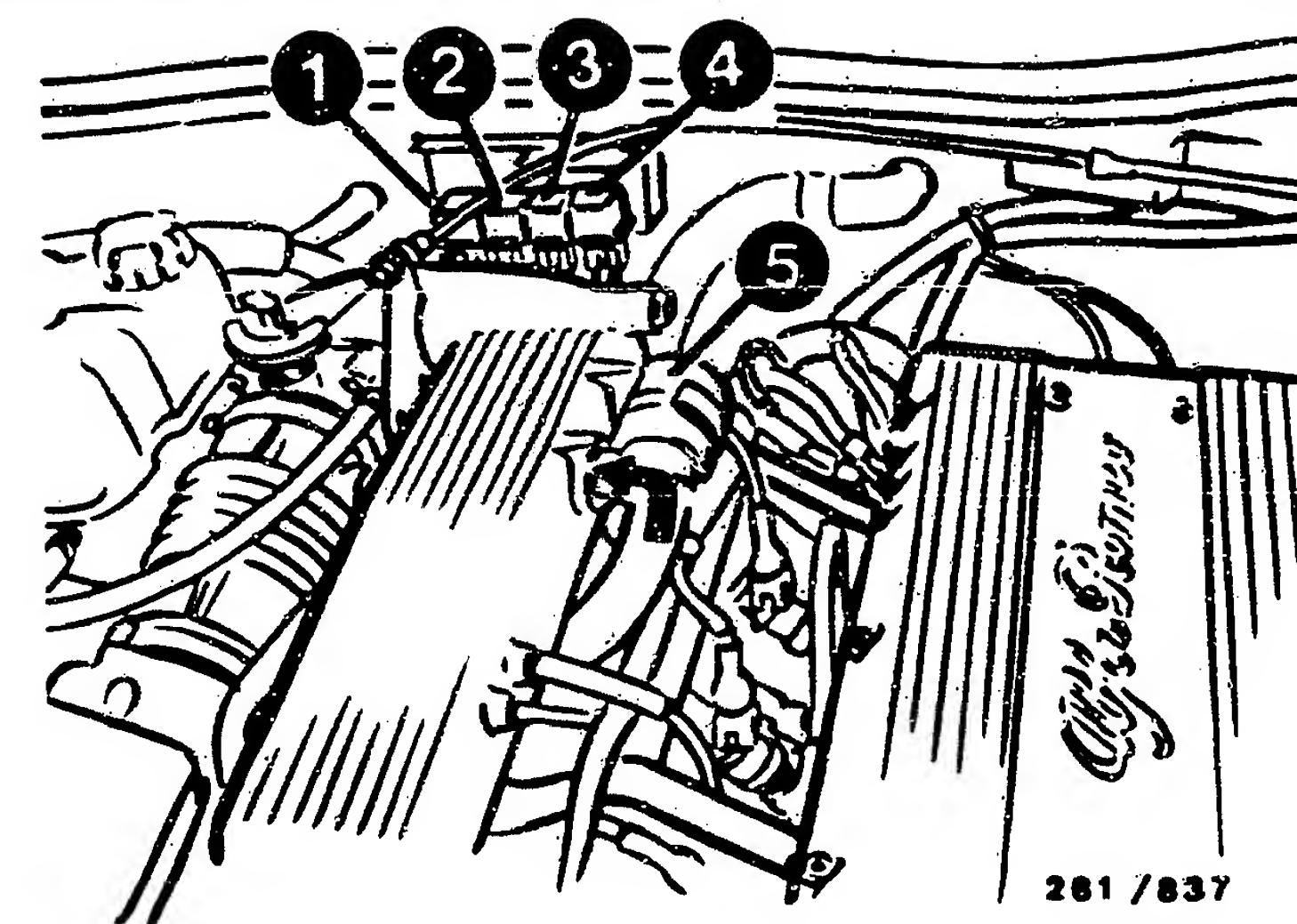
N>

*Renew relay for camshaft switching if resistance of relay coil is not within tolerance.

*If no voltage at term. 86, test lead to pump relay term. 30 for continuity.

*If actuation lead of relay and spring contacts in control-unit plug O.K., it must be assumed that the output stage is defective.

Renew control unit.



Alfa 75 Twin Spark S:

1 = Fuel pump relay

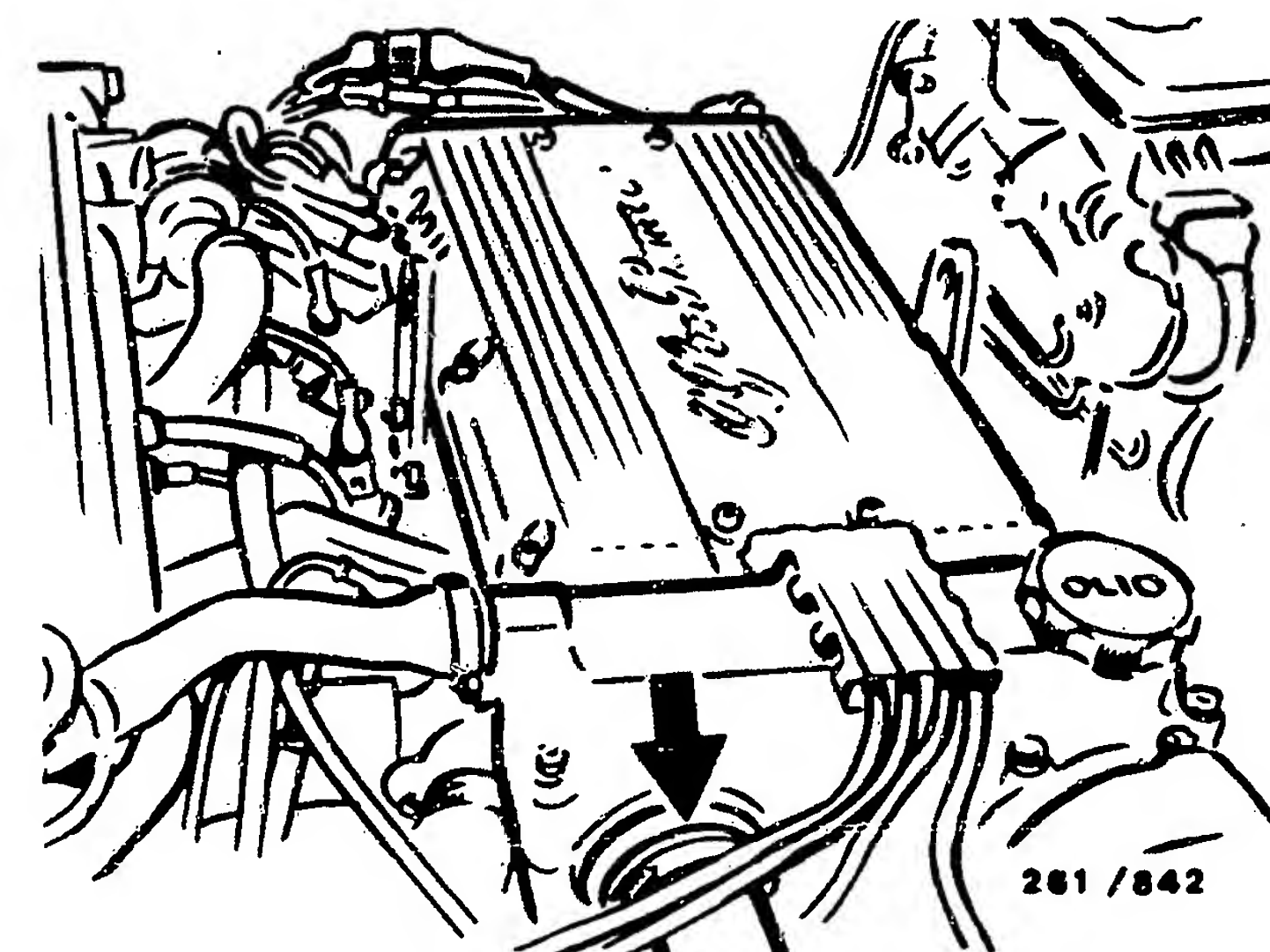
2 = Main relay
(with red mark)

3 = Relay for camshaft
switching

4 = Relief relay

Alfa 75 Twin Spark S:

Arrow = Solenoid valve for
camshaft switching



Return to self-diagnosis
test table B17

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (15)

V

SELF-DIAGNOSIS FLASHING CODE
1 2 5 1

The digital section (program memory) in the control unit is tested.

Flashing code not present?

N>

Replace control unit

Y

Return to self-diagnosis test table B17

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (16)

SELF-DIAGNOSIS FLASHING CODE
1 2 6 5

N>

Repair defective lead.

If there is one, this flashing code is used to test the built-in vehicle fault lamp ("CARB" lamp in US models).

Test:

1. Test lead to control unit term.
17 for worn cable insulation
and occasional contact with ground
and other leads.

2. With self-diagnosis tester at
serial interface.

Lead O.K.?

Return to self-diagnosis
test table B17

D13

<==>

D14

<==

TROUBLE-SHOOTING PROGRAM (1)

* Check power supply to control unit:

Switch off ignition.

Disconnect control-unit plug (top picture).

Connect voltmeter to disconnected control-unit plug term. 35 (+) and term. 5 (-).

Switch on ignition.

SET VALUE: Battery voltage

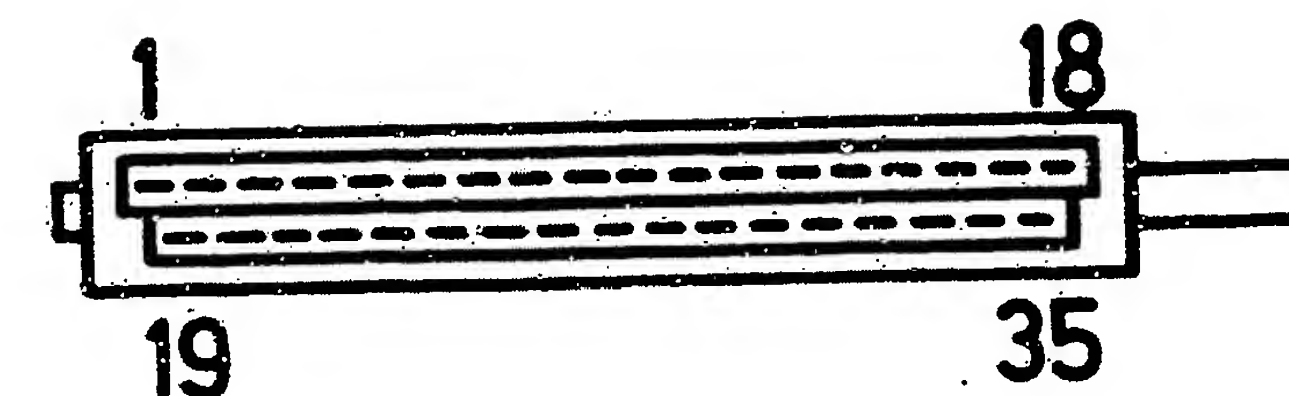
Set value obtained?

Switch off ignition.

1. Connect ohmmeter to disconnected control-unit plug term. 5 and ground lead for control unit (bottom picture).

Ohmmeter must indicate approx. $0\ \Omega$ (continuity).

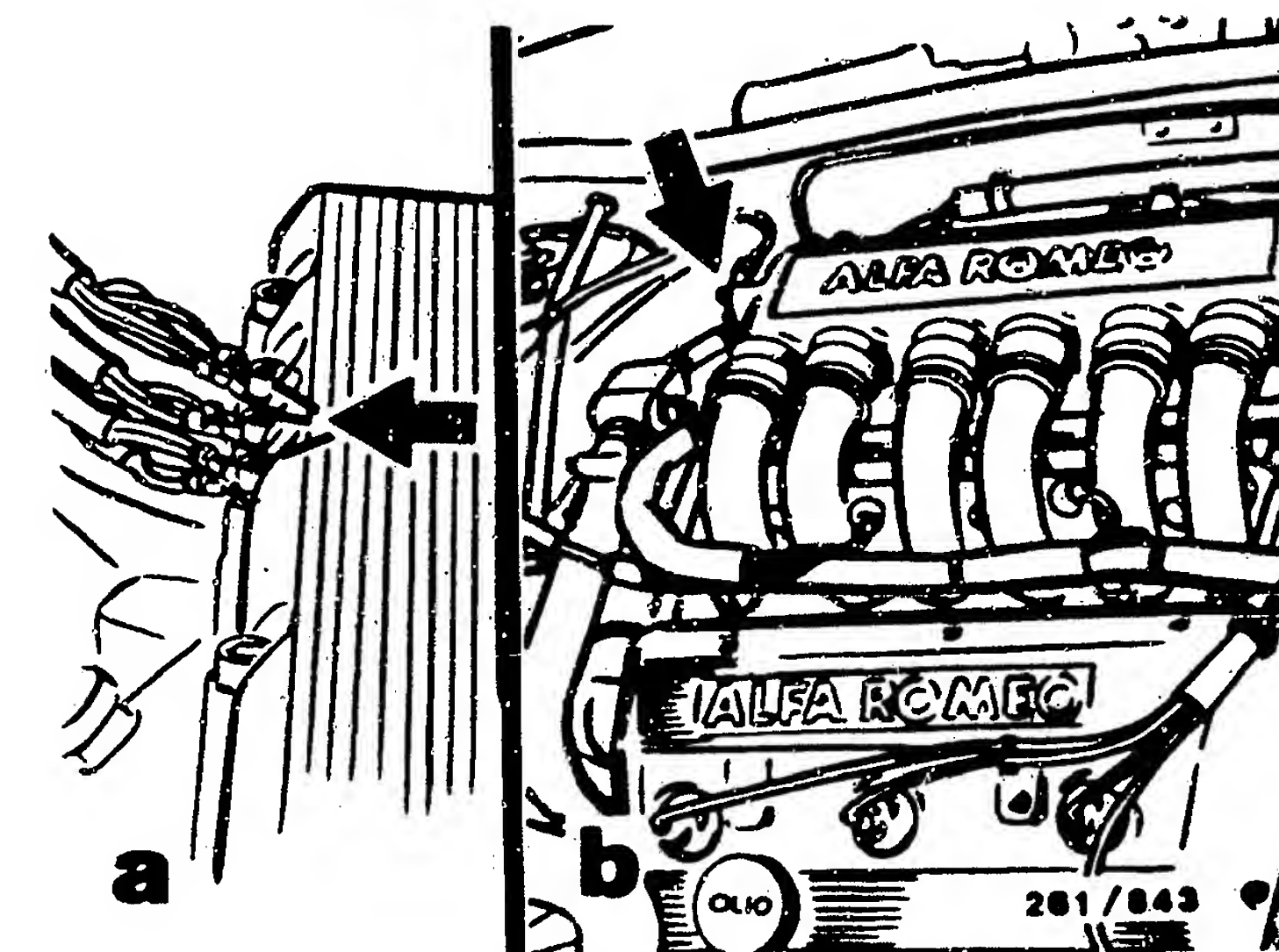
Eliminate open circuit or contact resistance at ground terminal.



261/685

Top view of 35-pin control-unit plug of Motronic wiring harness

Picture a: Alfa 75 Twin Spark S
Picture b: Alfa 164 3.0 V6
Arrows=Motronic ground terminals



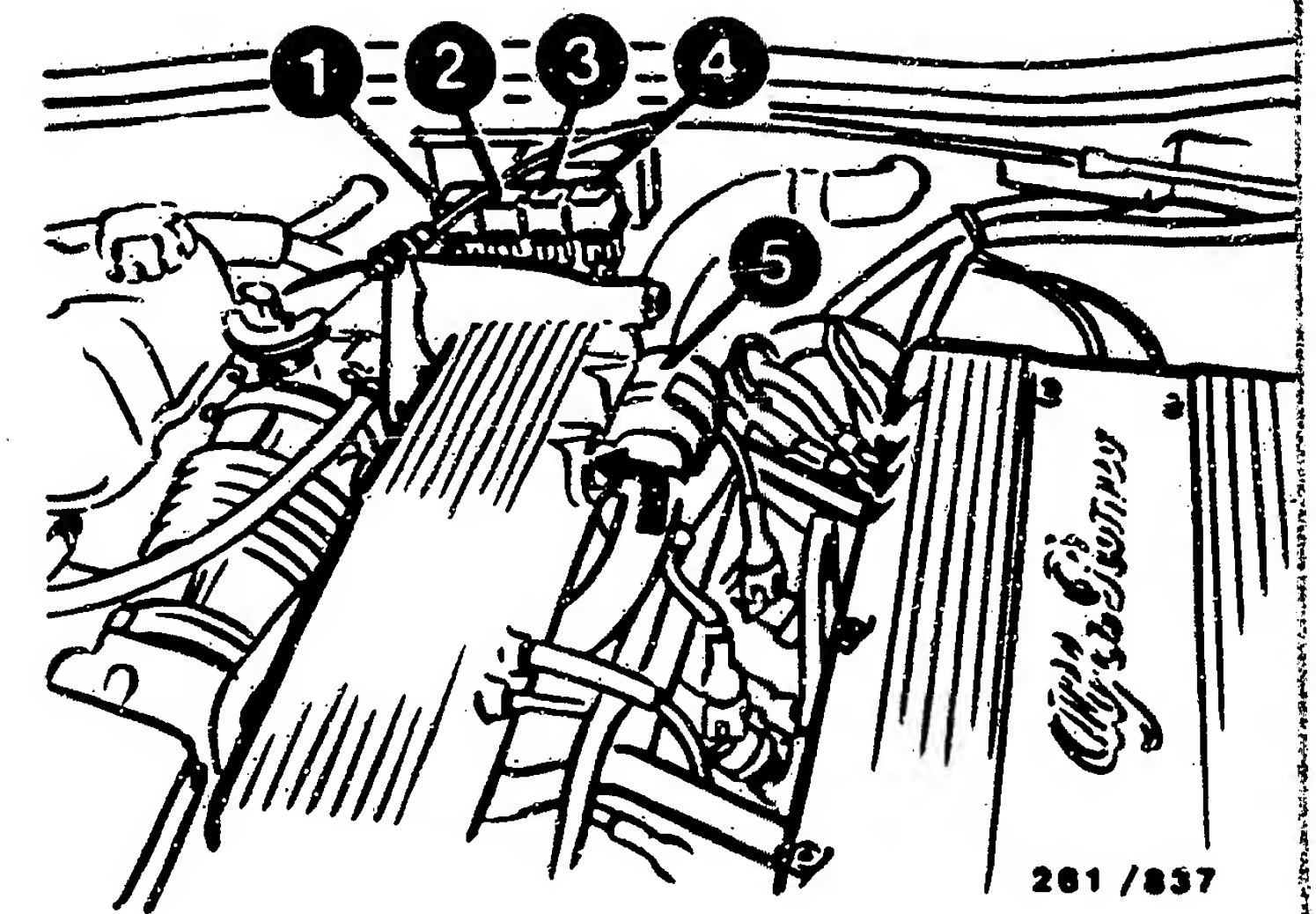
Return to trouble-shooting chart B03

Continued on next picture page

- V
2. Test following lead for continuity:
From control unit term. 35 to main relay term. 87.
 3. Measure voltages at main relay:
 - 3.1 Detach main relay and connect voltmeter to frame term. 86 and term. 85.
Switch on ignition.
Voltmeter must indicate battery voltage.
If not, test for continuity in leads from ignition lock term. 15 to relay term. 86 and from relay term. 85 to ground terminal.
 - 3.2 Connect voltmeter to relay frame term. 30 and term. 85.
Battery voltage must be measured.
If not, test lead to battery positive terminal.
 - 3.3 Connect voltmeter to relay frame term. 87 and term. 85.
Switch on ignition.
Battery voltage must be measured.
If not, main relay defective.
 4. Main relay defective

V

Return to trouble-shooting chart
B03

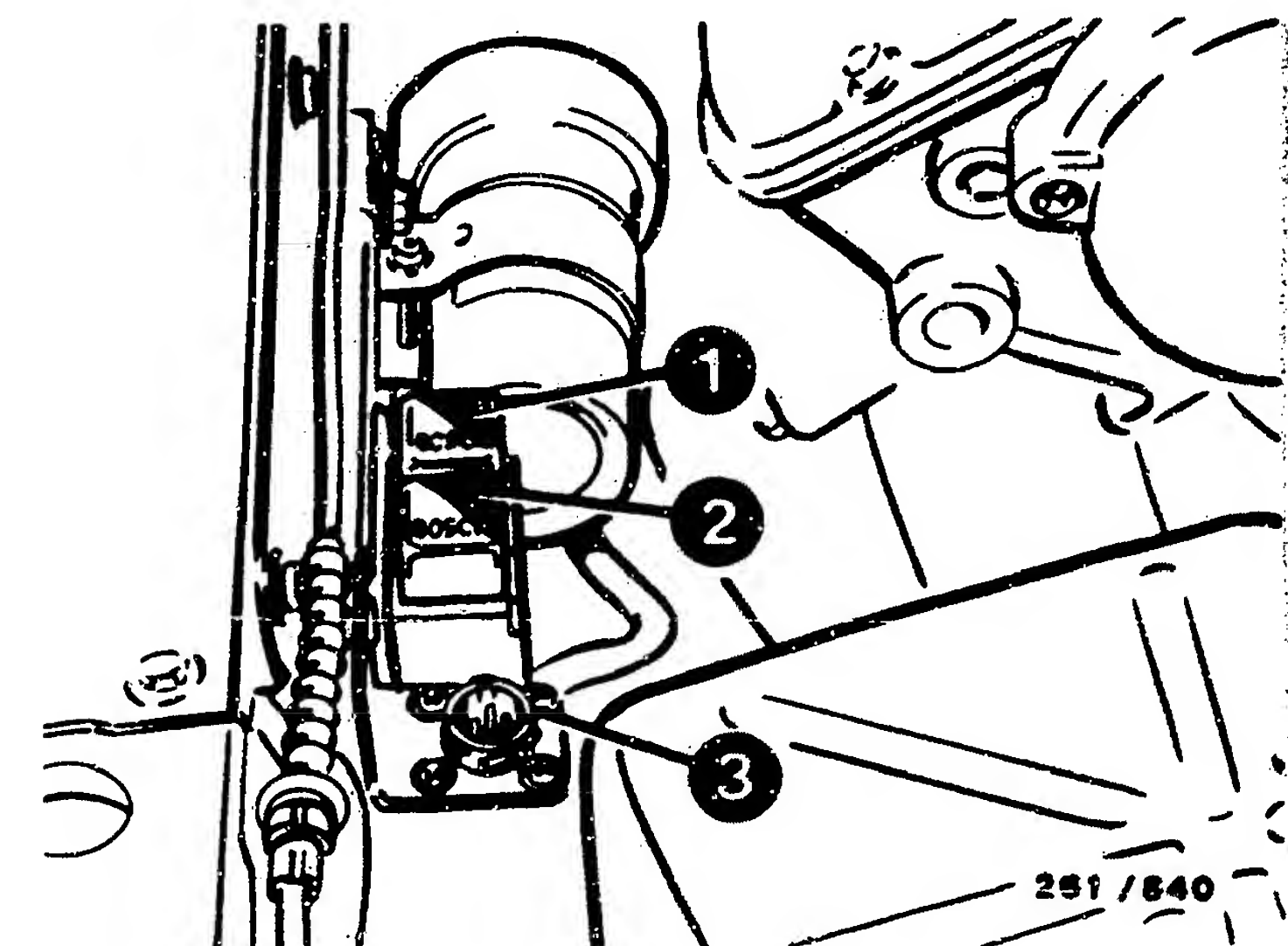


Alfa 75 Twin Spark S:

- 1 = Fuel pump relay
- 2 = Main relay
(with red mark)
- 3 = Relay for camshaft
switching
- 4 = Relief relay

Alfa 164 3.0 V6

- 1 = Fuel pump relay
- 2 = Main relay
(with red mark)
- 3 = Self-diagnosis socket



TROUBLE-SHOOTING PROGRAM (2)

Test solenoid-operated injection valves using actuator diagnosis.

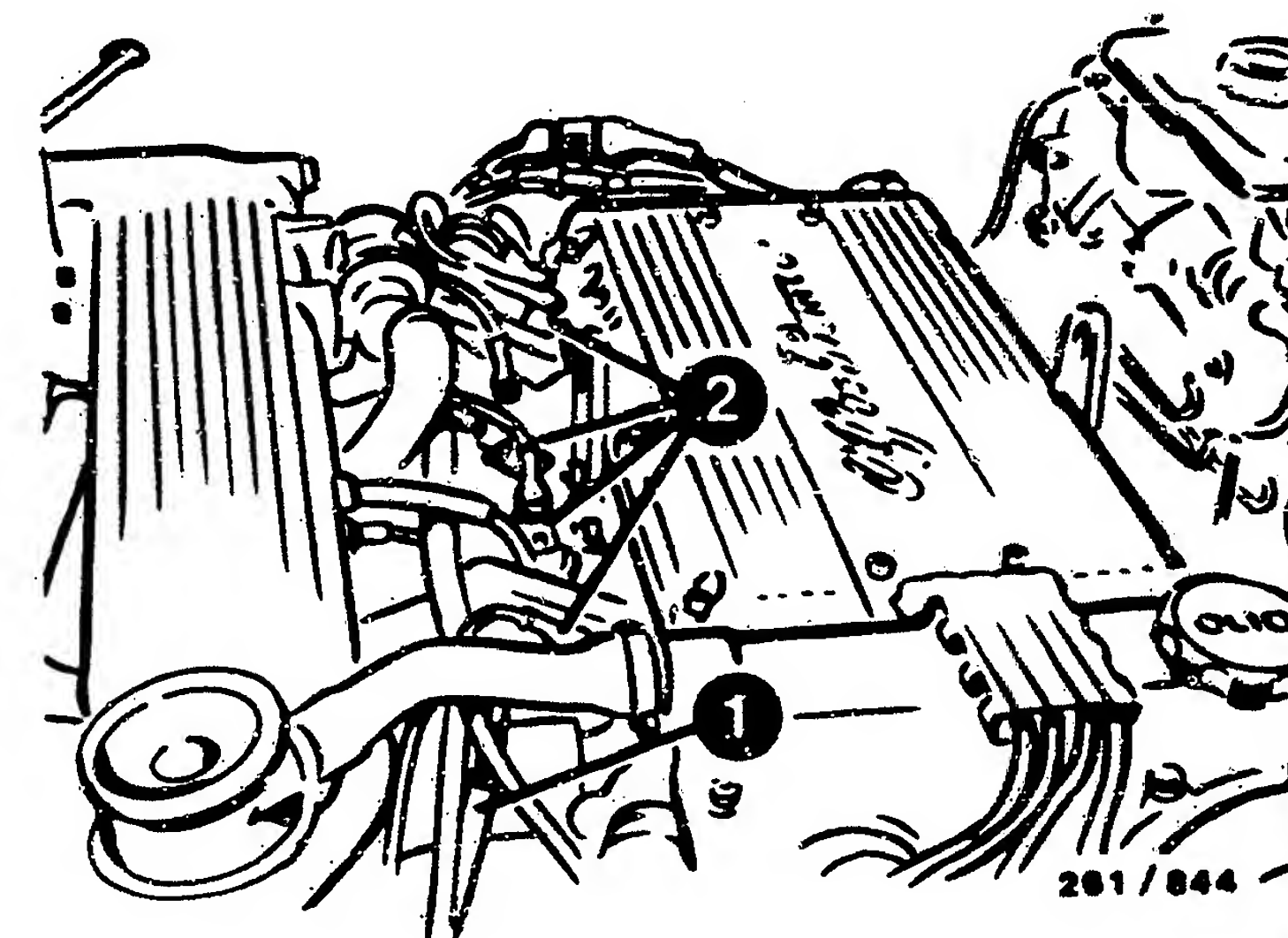
N>

Activate actuator diagnosis as described under "Special features".

With flashing code 1411 injection valves should be audibly pulsed. In order to be able to test the injection valves individually, only leave one valve connected in each case (detach all other injection-valve plugs).

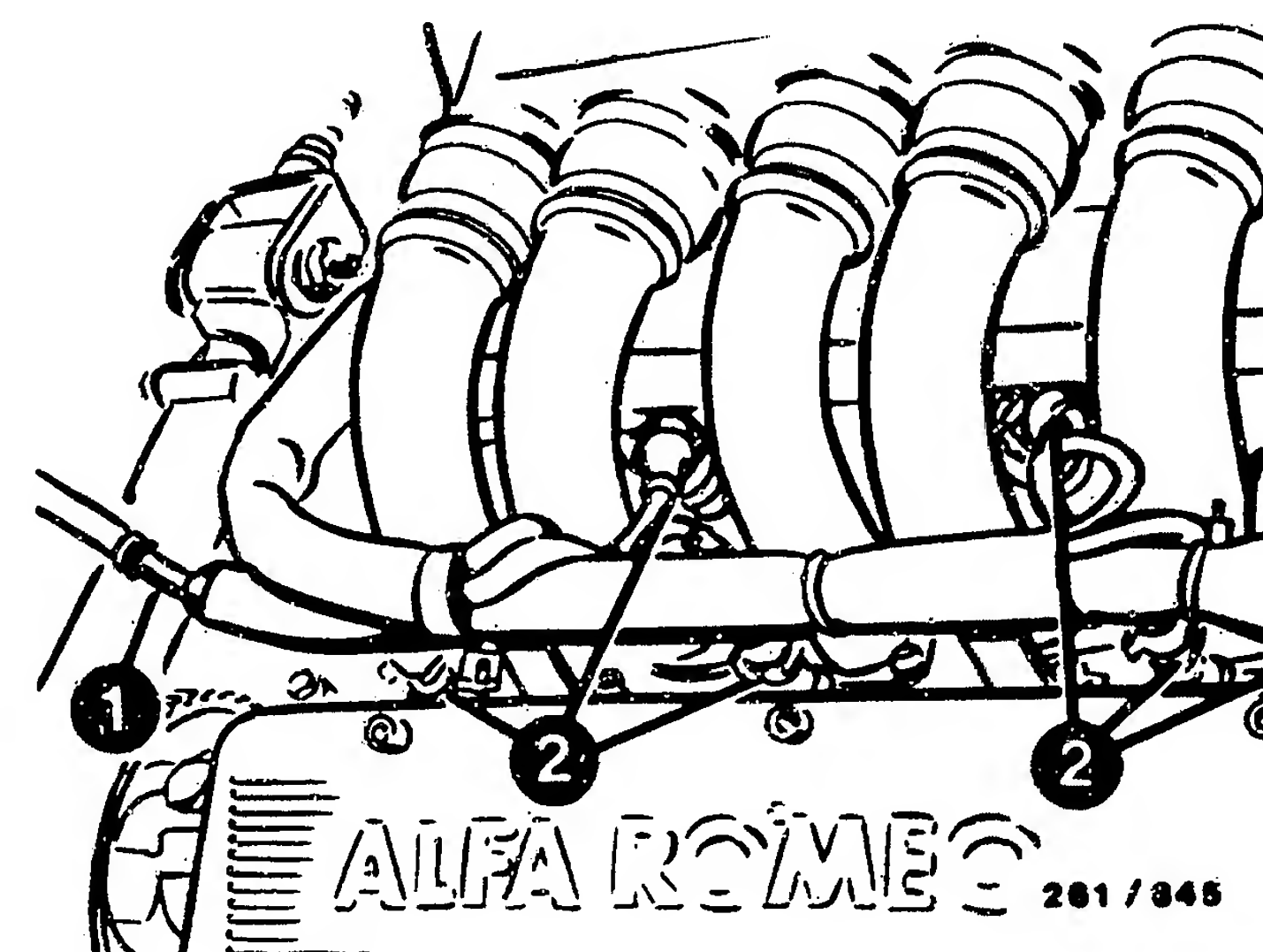
1. Pulsing of injection valves clearly audible ?
2. All valves O.K. ?

- * Test for continuity in positive leads from injection valves to main relay term. 87 and in negative leads to control unit term. 14.
Spring contact no. 14 in control-unit plug O.K. ?
It must not be possible to push it back.
- * Test solenoid-operated injection valve with ohmmeter.
Set value: 14,5...17 Ω
If applicable, renew defective injection valve
Note:
A valve may be defective (mechanical defect) despite correct resistance.



Alfa 75 Twin Spark S:
1=Connection point for fuel pressure measurement
2=Solenoid-operated injection valves

Alfa 164 3.0 V6:
1=Connection point for fuel pressure measurement
2=Solenoid-operated injection valves



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (2) CONTINUED (1)

Measure signal at solenoid-operated injection valve.
Test function and interference.

Connect 2-pole test lead
1.684 463 093 between one solenoid-operated injection valve and its connector.

Connect Motortester (special input) to test lead.

Connect black pickup to vehicle ground.

Connect red pickup to one of the two connections of the test lead.

Start engine/let it run.

Given correct connection, injection pulses are visible on the oscilloscope.

If no pulse is visible, make contact between red pickup of tester and other pin in injection valve.

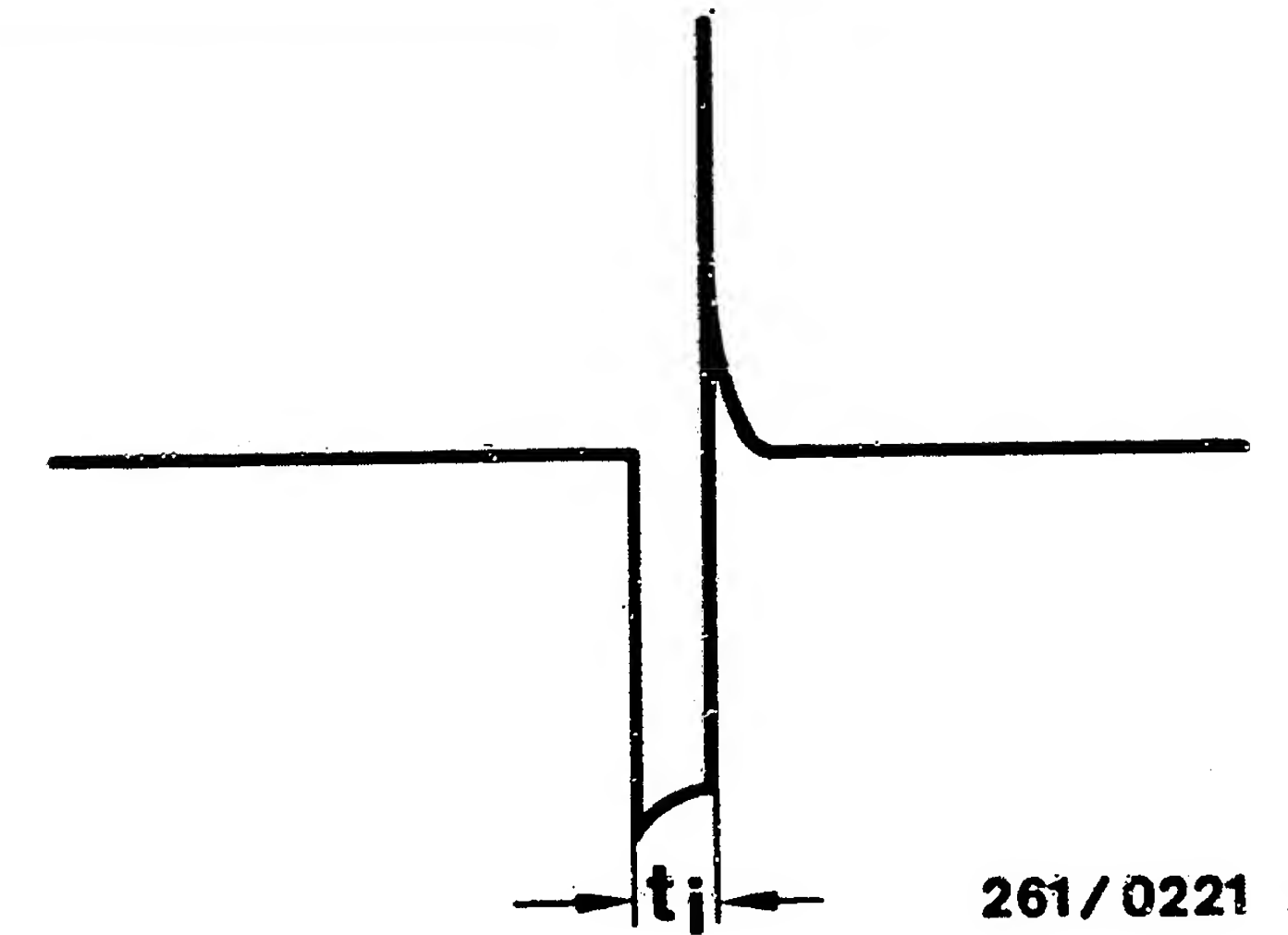
Correct injection signal present as shown in upper picture ?

N>

* No injection signal:
Control unit defective (injection output stage)

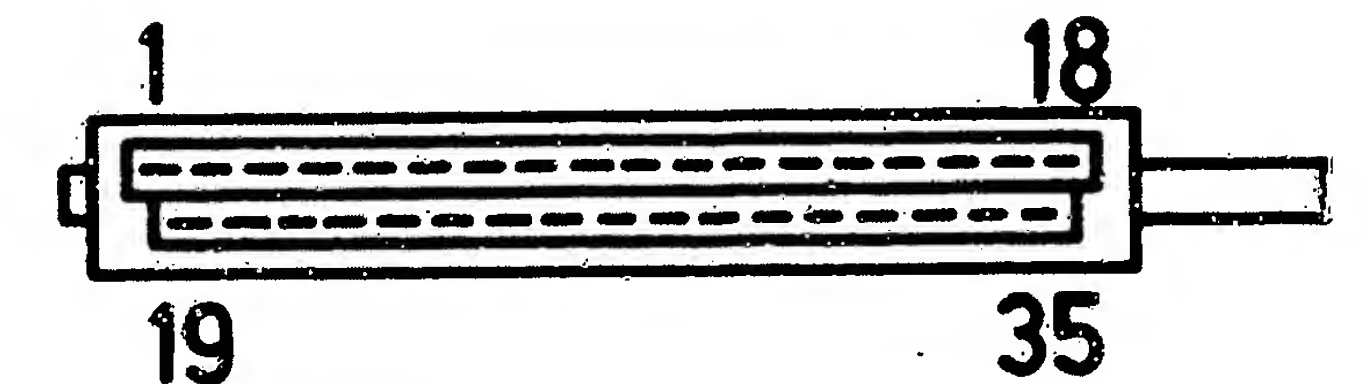
* Interference:
Test routing of leads.
Create wiring-harness/H.T. ignition cable spacing.
Also test alternator (e.g. worn carbon brushes) and alternator regulator.

* Missing:
Test injection-valve plugs and all other connections.
Spring contacts in plug must be engaged and it must not be possible to push them back.
Contact surfaces must be bright.
Move connections with engine running and pay attention to missing.



Injection signal
 t_i = Duration of injection

Top view of 35-pin control-unit plug of Motronic wiring harness



Return to trouble-shooting chart B03

261/685

D21

<==>

D22

<==>

TROUBLE-SHOOTING PROGRAM (3)

Test idle actuator using actuator diagnosis.

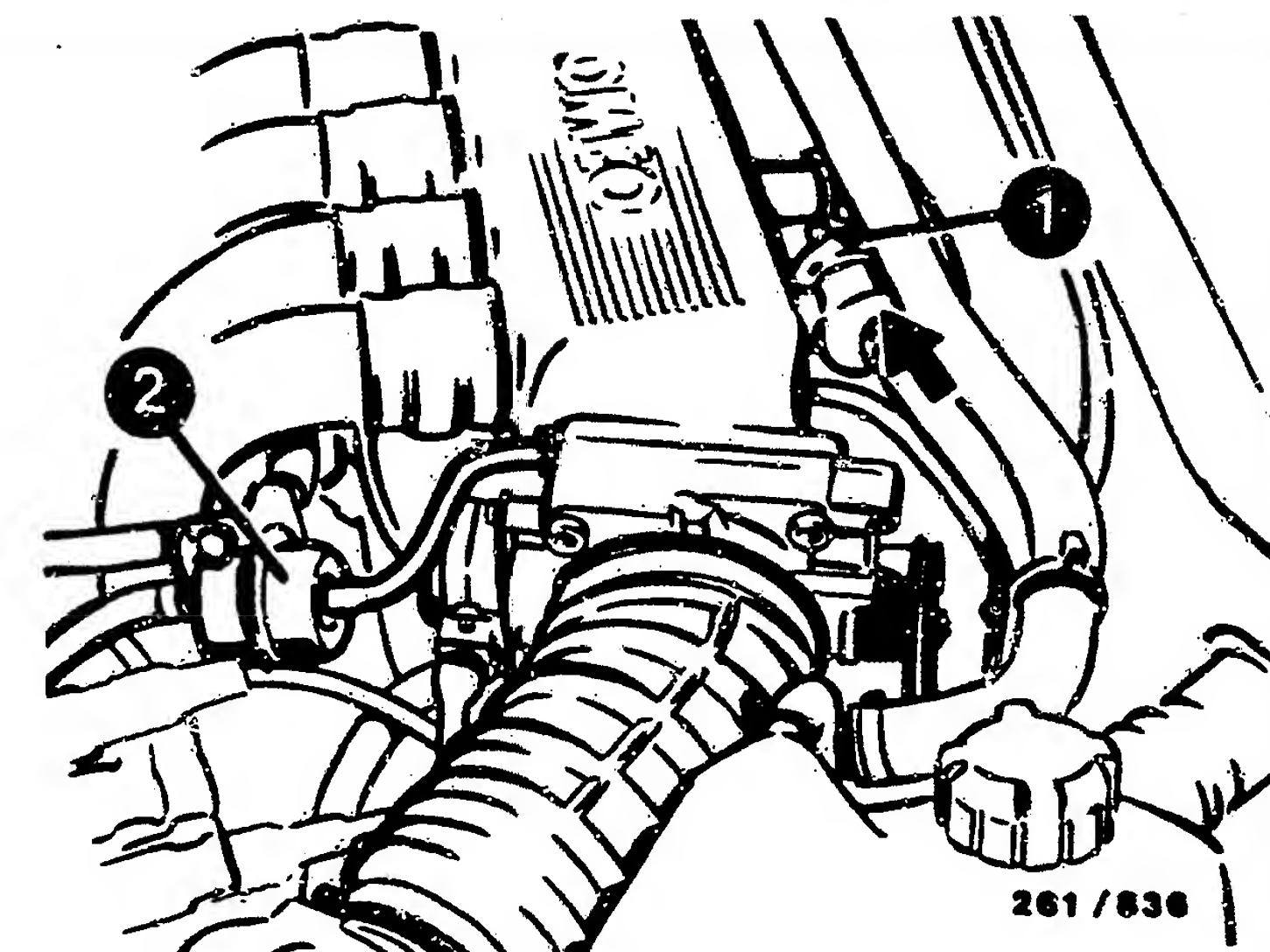
Activate actuator diagnosis as described under "Special features".

With flashing code 1412 idle actuator should be periodically actuated (audibly).

Actuation of idle actuator clearly audible ?

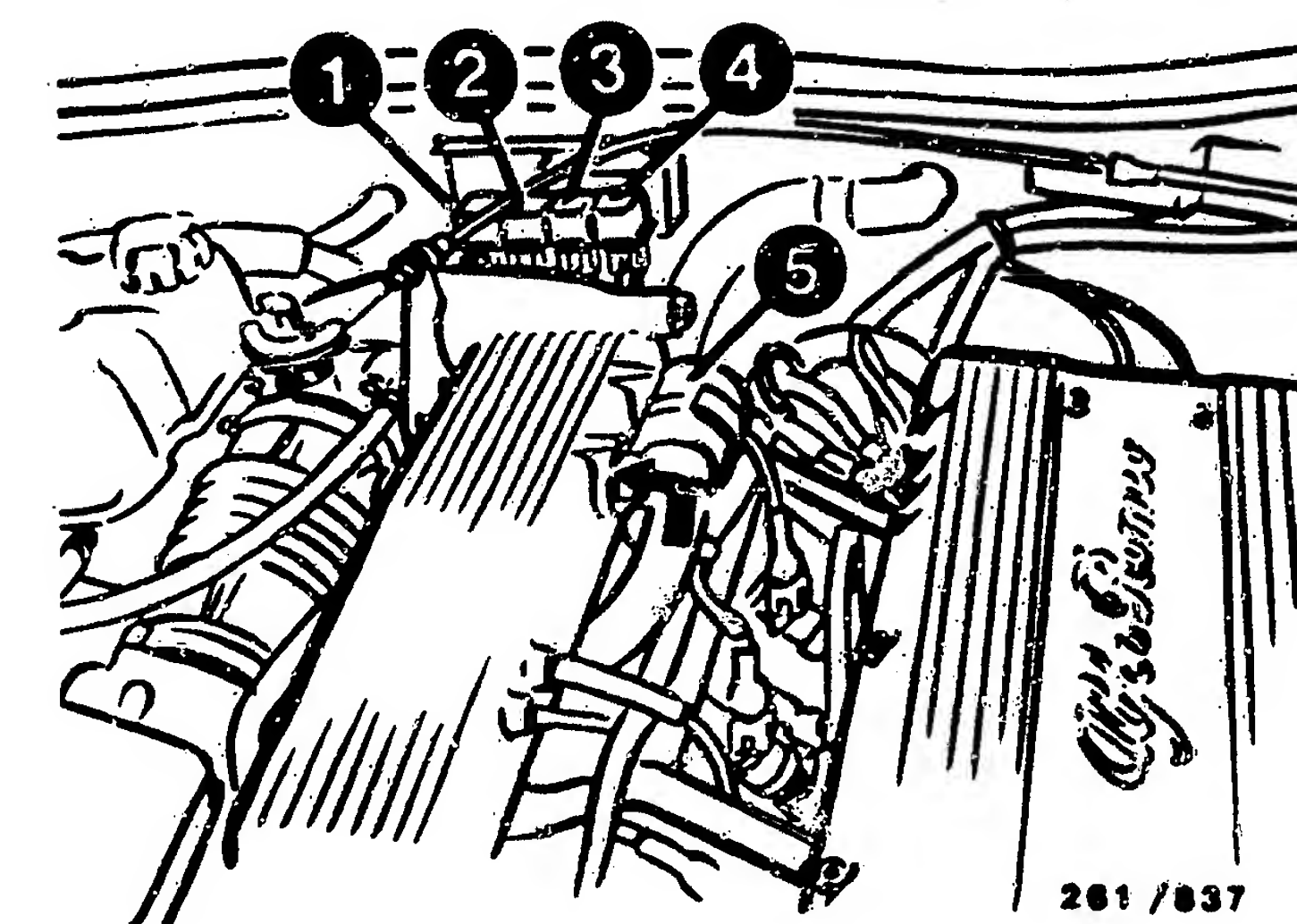
N>

- * Test idle-actuator leads for continuity:
Positive lead to main relay term. 87 and negative lead to control unit term. 33.
Spring contact no. 33 in control-unit plug O.K. ?
It must not be possible to push it back.
- * Test idle-actuator winding with ohmmeter.
Set value: see brief instructions
If applicable, renew idle actuator.
Note:
The actuator may be defective (rotary slider mechanically blocked) despite correct resistance.



Alfa 164 3.0 V6:
1 = Idle actuator
2 = Fuel pressure regulator
Arrow = Direction of flow

Alfa 75 Twin Spark S:
5 = Idle actuator
Arrow = Direction of flow



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (4)

Test relay and solenoid valve for camshaft switching using actuator diagnosis (2 l engines only).

Activate actuator diagnosis as described under "Special features".

With flashing code 1414 relay for camshaft switching should be periodically switched (audibly). Solenoid valve for camshaft switching must be actuated at the same time (can be seen with voltmeter directly at valve). Solenoid valve can be felt to respond.

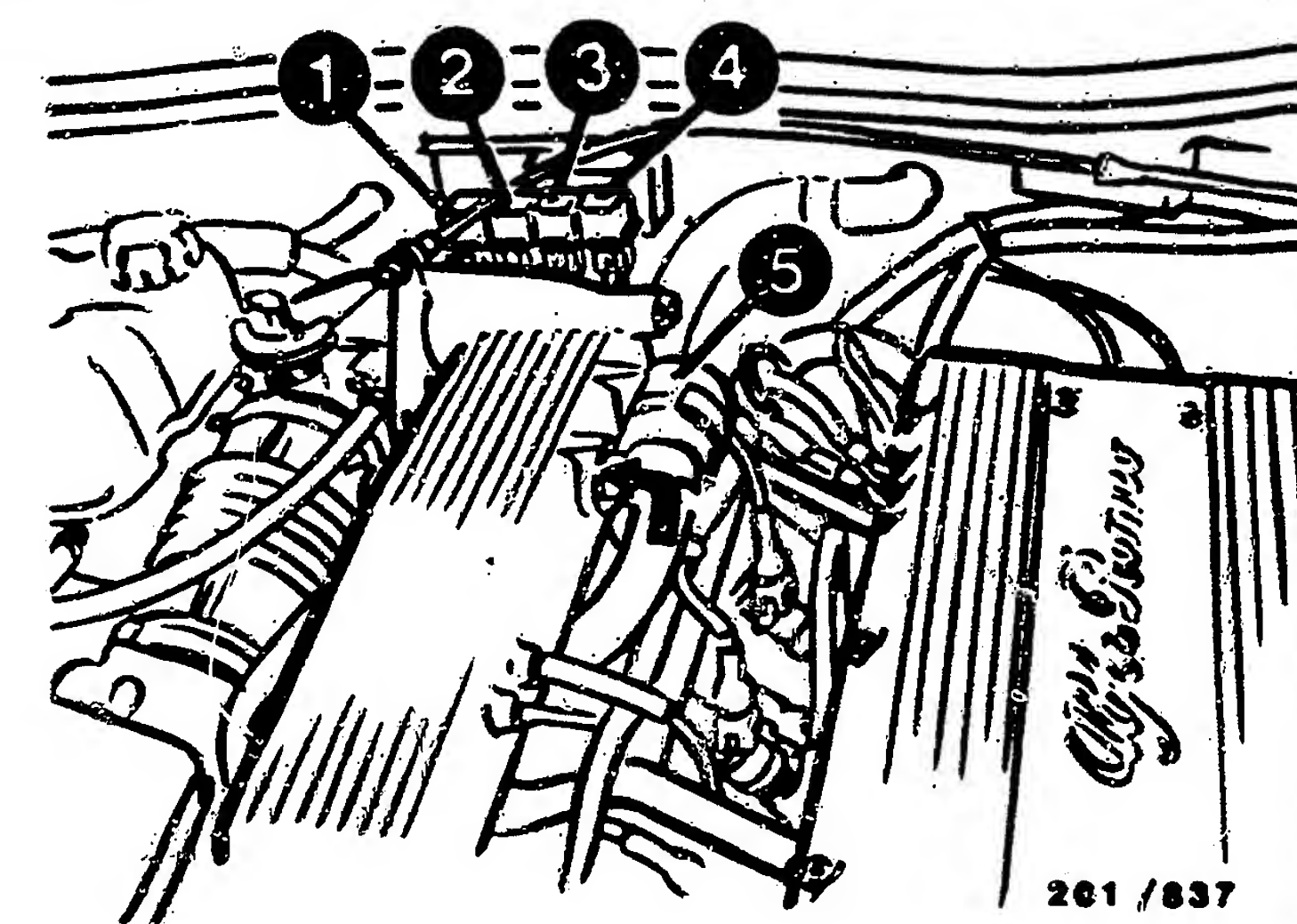
Does camshaft switching function?

POSSIBLE FAULTS:

1. Relay for camshaft switching is heard to switch in the course of actuator diagnosis, however solenoid valve for camshaft switching does not function:

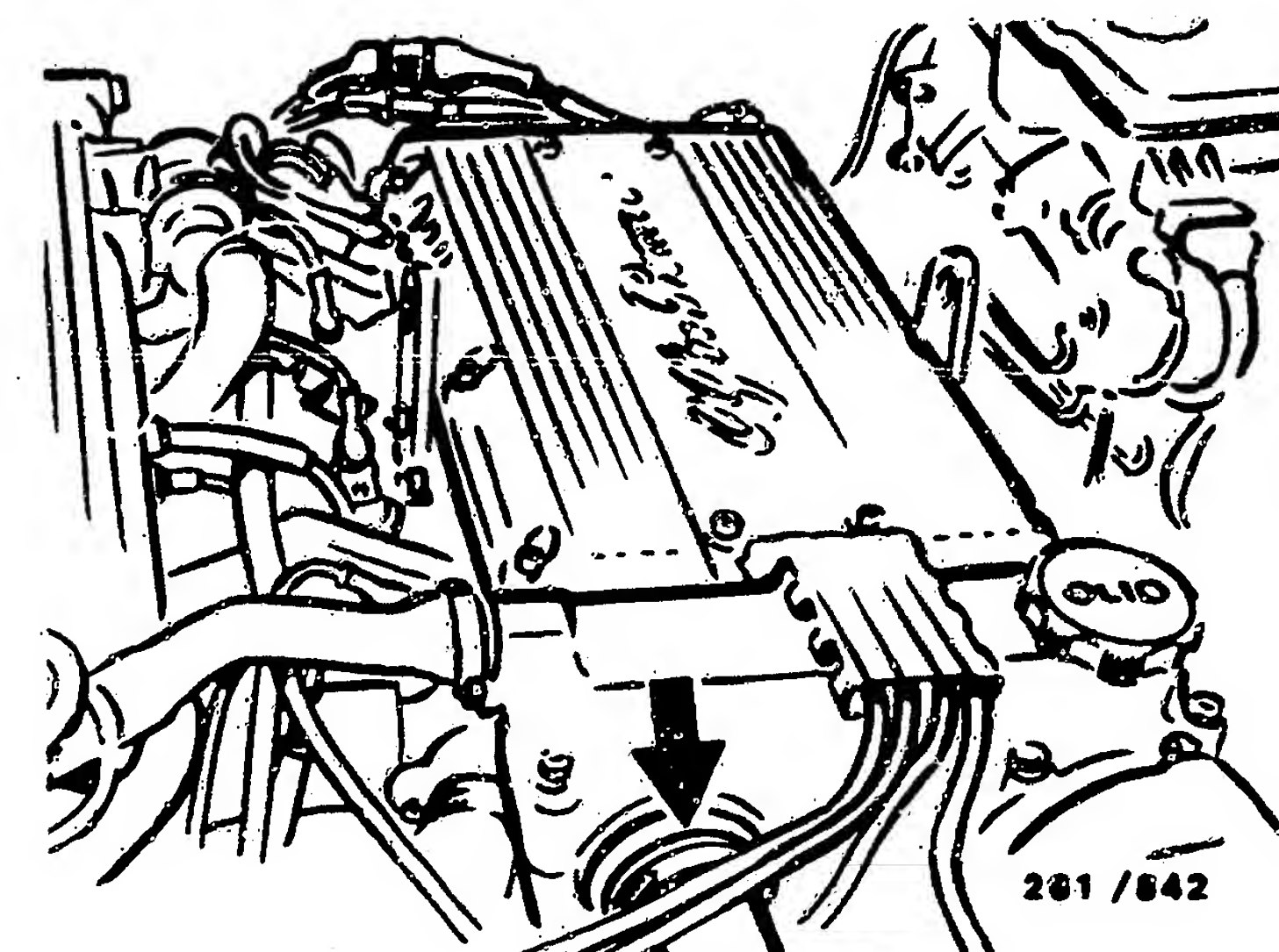
- * No voltage change at solenoid valve:
-Test one of the two solenoid-valve leads for continuity to ground and the other to the relay for camshaft switching (term. 87). Battery voltage must be measured at term. 30 of the same relay with the ignition switched on, otherwise proceed with the trouble-shooting as per circuit diagrams.

- * Voltage changes at solenoid valve, however solenoid valve cannot be felt to respond:
Test solenoid-valve winding with ohmmeter
Set value:
See brief instructions.
Renew solenoid valve if necessary.
Note:
The valve may be defective (mechanically blocked) despite correct resistance.



Alfa 75 Twin Spark S:
1 = Fuel pump relay
2 = Main relay
(with red mark)
3 = Relay for camshaft switching
4 = Relief relay

Alfa 75 Twin Spark S:
Arrow = Solenoid valve for camshaft switching

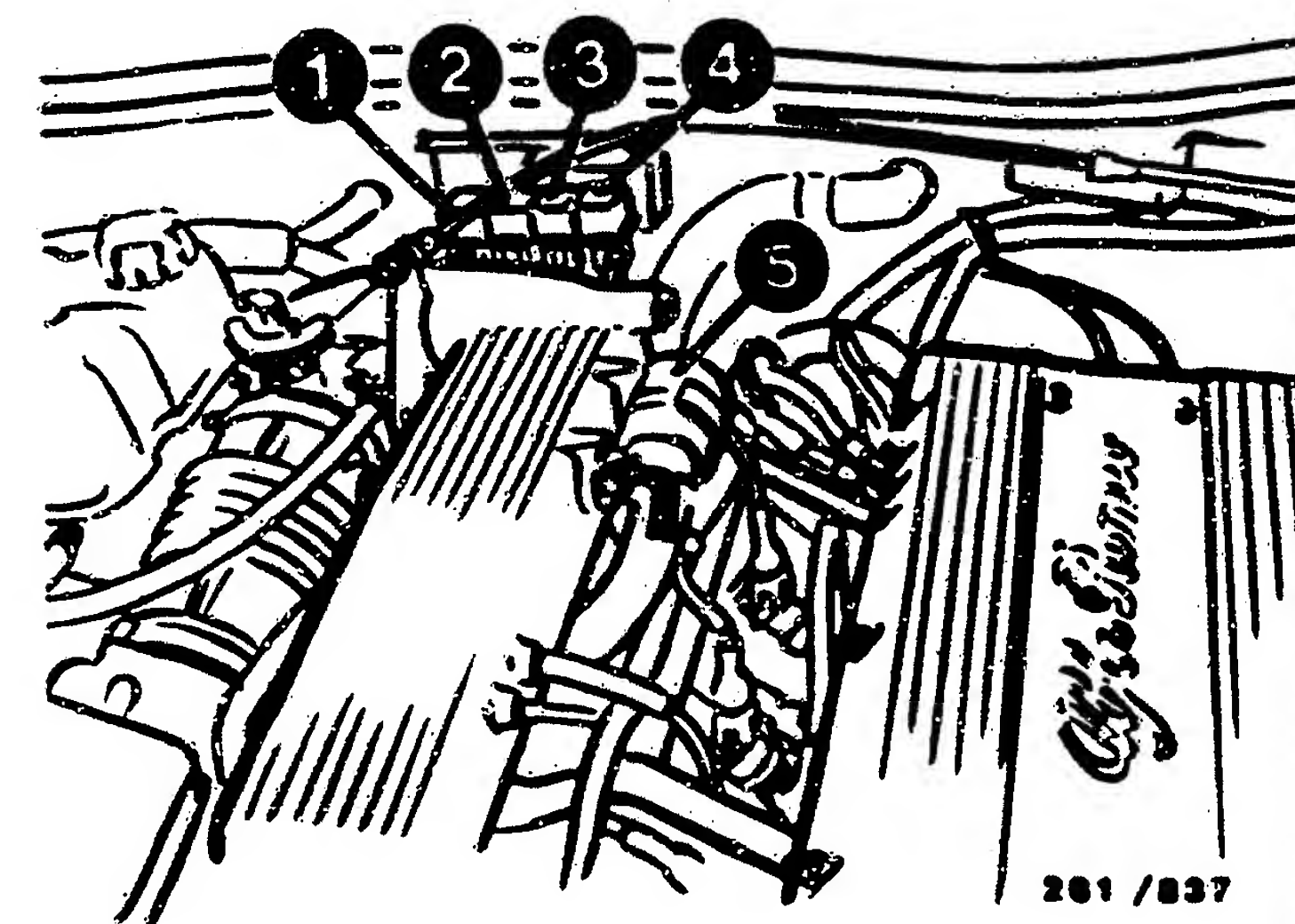


Return to trouble-shooting chart B03

Continued on next picture page

2. Relay for camshaft switching
doesn't switch:

- * Detach relay and measure
resistance of relay coil
(term. 86 with respect to term.
85).
SET VALUE: 50...150 Ω
- * Measure voltage at term. 86
in relay frame with respect to
vehicle ground with ignition
switched on.
SET VALUE: Battery voltage
- * Ignition off, detach control
unit:
Check for continuity in actuation
lead of relay (term. 85 in relay
frame) with respect to term. 31
in control-unit plug.
Spring contact no. 31 in control-
unit plug O.K. ?
It must not be possible to push
it back.
- * Output stage defective, renew
control unit.



Alfa 75 Twin Spark S:

- 1 = Fuel pump relay
- 2 = Main relay
(with red mark)
- 3 = Relay for camshaft
switching
- 4 = Relief relay

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (5)

Test (catalytic-converter models only) tank-ventilation switching valve (TES) using actuator diagnosis.

Activate actuator diagnosis as described under "Special features".

With flashing code 1413 TES should be periodically actuated (it can be seen with voltmeter directly at valve).

Note:

It may also be possible to feel TES respond. If not, detach bleeder hose at intake-manifold-end connection of TES and connect vacuum pump (e.g. Mityvac)...

-Valve deenergized:

No continuity, i.e. build-up of vacuum possible

-Valve energized:

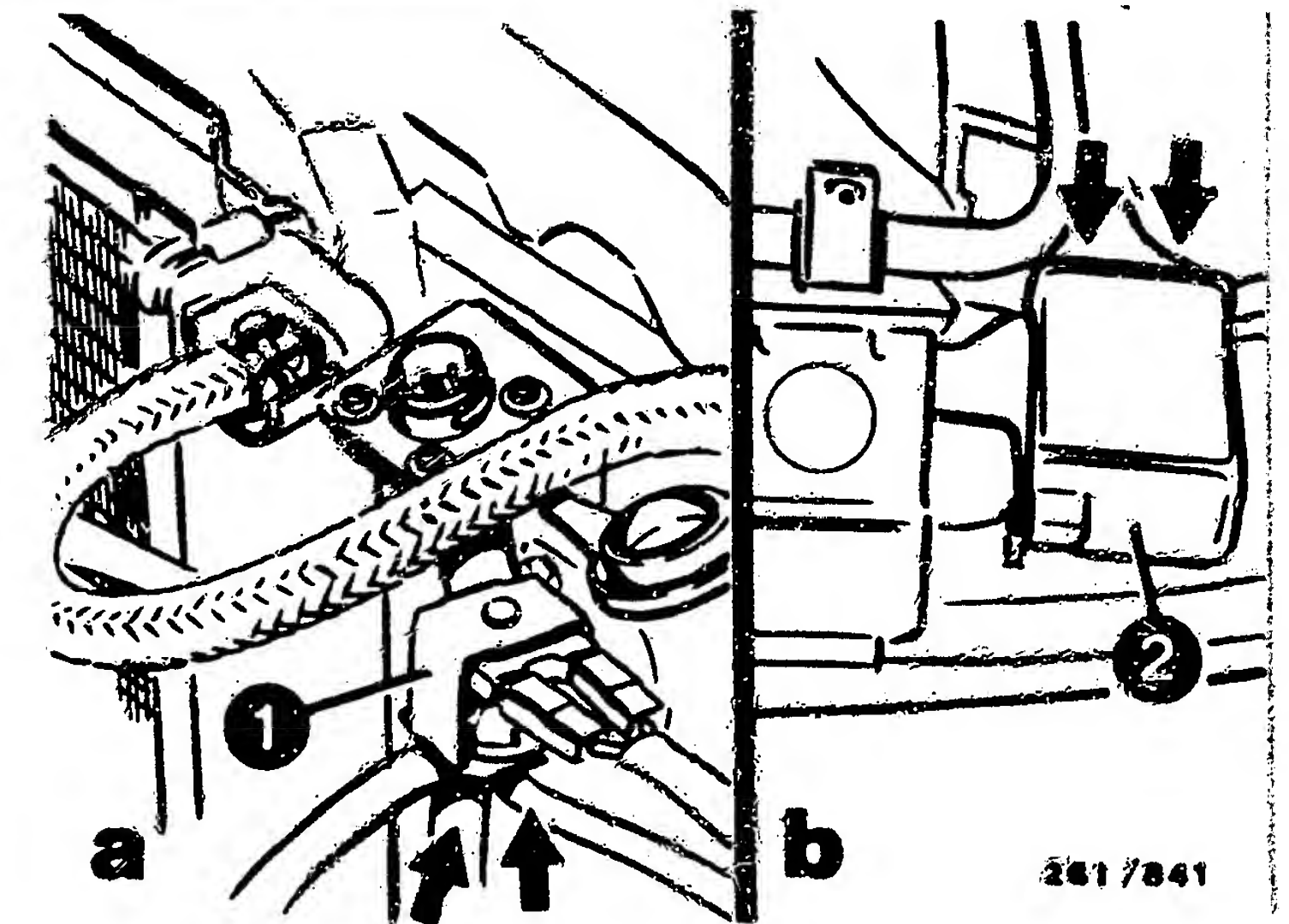
Continuity, i.e. no vacuum build-up possible.

Does actuator diagnosis of TES function ?

N>

* No voltage change at TES with actuator diagnosis running:
Test TES leads.
Battery voltage must be present with the ignition switched on at one of the two leads (trouble-shooting as per circuit diagram).
Test the second lead for continuity to control unit term. 34.
Spring contact no. 34 in control-unit plug O.K. ? It must not be possible to push it back.

* Voltage change at TES with actuator diagnosis running, however no TES response:
Test TES winding with ohmmeter
Set valve:
See brief instructions.
Renew TES if necessary.
Note:
TES may be defective (mechanically blocked) despite correct resistance.



Alfa 75 Twin Spark S:

1 = Tank-ventilation switching valve (not from Bosch)

2 = Active-carbon container (beneath vehicle, in front of right-hand, front wheel house)

Arrows = Bleeder hoses

Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (6)

V

* Check internal resistance engine-speed/reference-mark sensor:

N>

Take apart plug connector to sensor.

Connect ohmmeter to plug to sensor between term. 23 and term. 25.

Set value: See brief instructions

Set value obtained?

V

Continued on next picture page

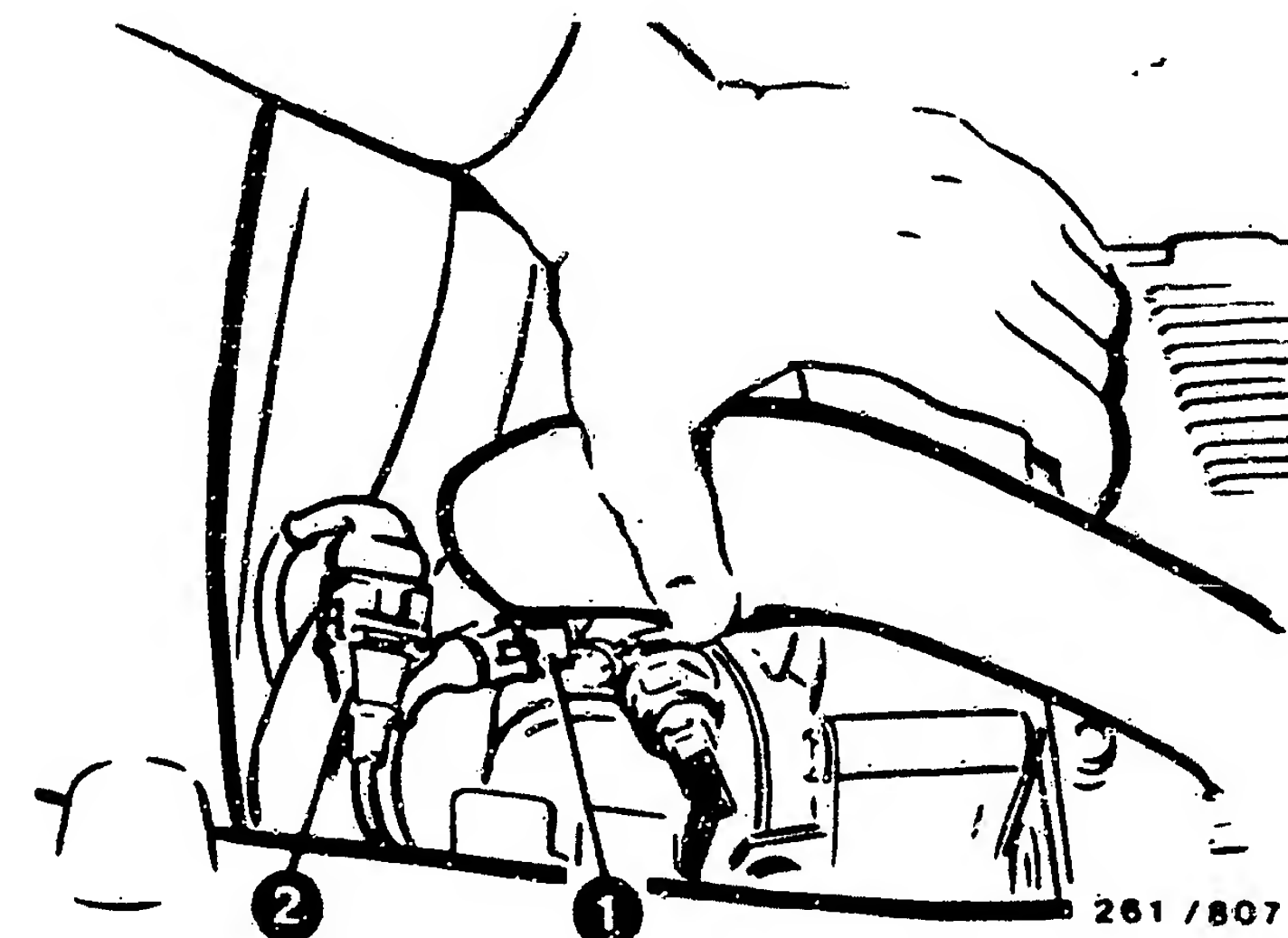
V

Sensor defective -> replace.

Notes on replacement:

Unscrew fastening screw and withdraw sensor. If stiff, help by turning and with screwdriver.

Do not take sensor out of protective sleeve until just before installation.
Before installing the sensor, make sure that there are no metallic parts sticking to the sensor (sensors contain permanent magnets).
Grease sensor with Longterm 2.
Press sensor by hand into the hole as far as it will go. Do not use force. Do not knock.
Make sure that the spring contacts in the plug are correctly seated. Spring contacts must not allow themselves to be pushed back and must be free from corrosion. Plug connector must latch in.

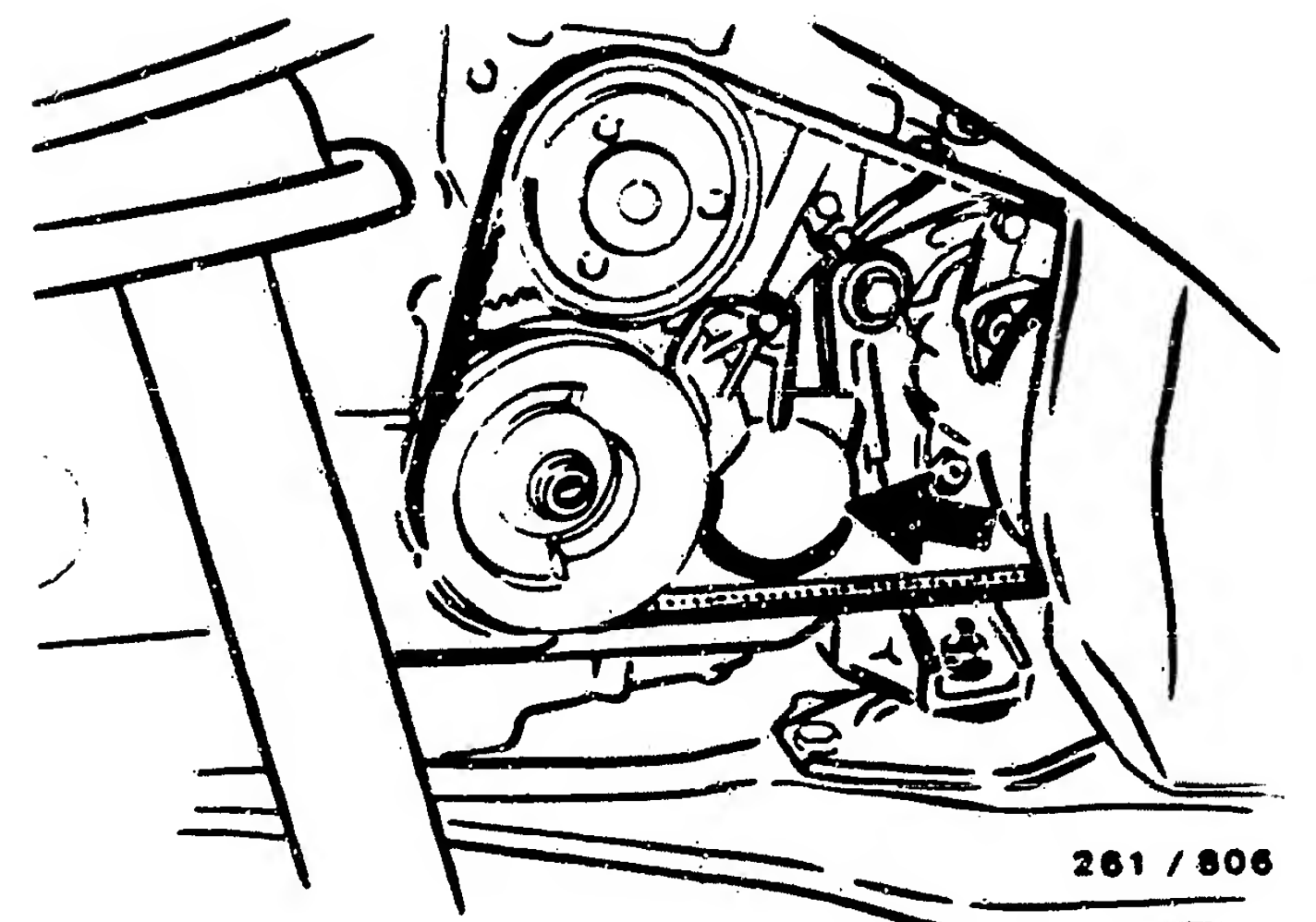


Alfa 164 3.0 V6:

1 = Temperature sensor (engine)
2 = Plug connection of engine-speed/reference-mark sensor

Alfa 164 3.0 V6:

Arrow = Engine-speed/reference-mark sensor (behind cover)



TROUBLE-SHOOTING PROGRAM (6) CONTINUED (1)

Check engine-speed/reference-mark sensor for short circuit to ground (insulation damage):

Disconnect plug from control unit.
Sensor plug connector connected.

Connect ohmmeter to control-unit plug term. 23 and ground.

Set value: Infinity Ω

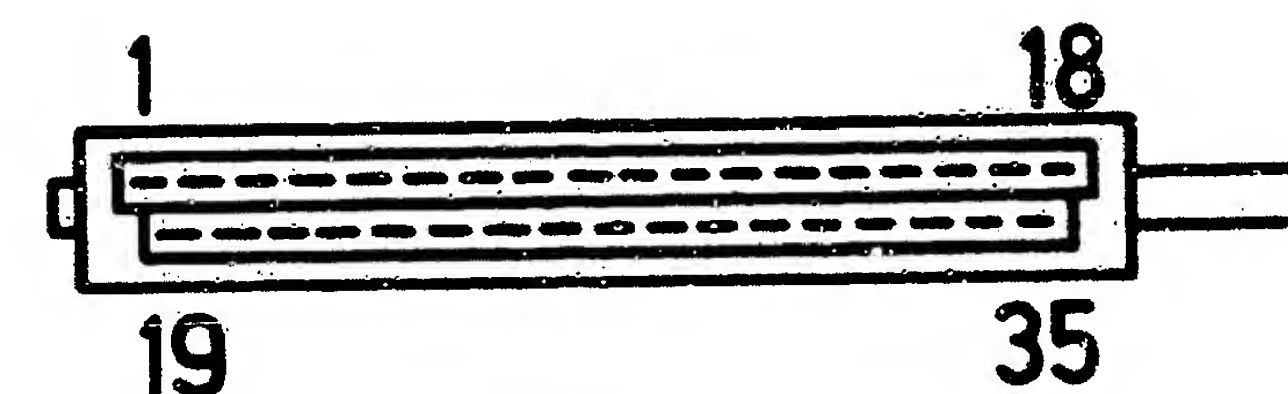
Watch for worn insulation and loose contacts.

Set value obtained?

N>

Set value less than 1 M Ω ;
Repair defective lead from control unit term. 23 or term. 25 to sensor plug.

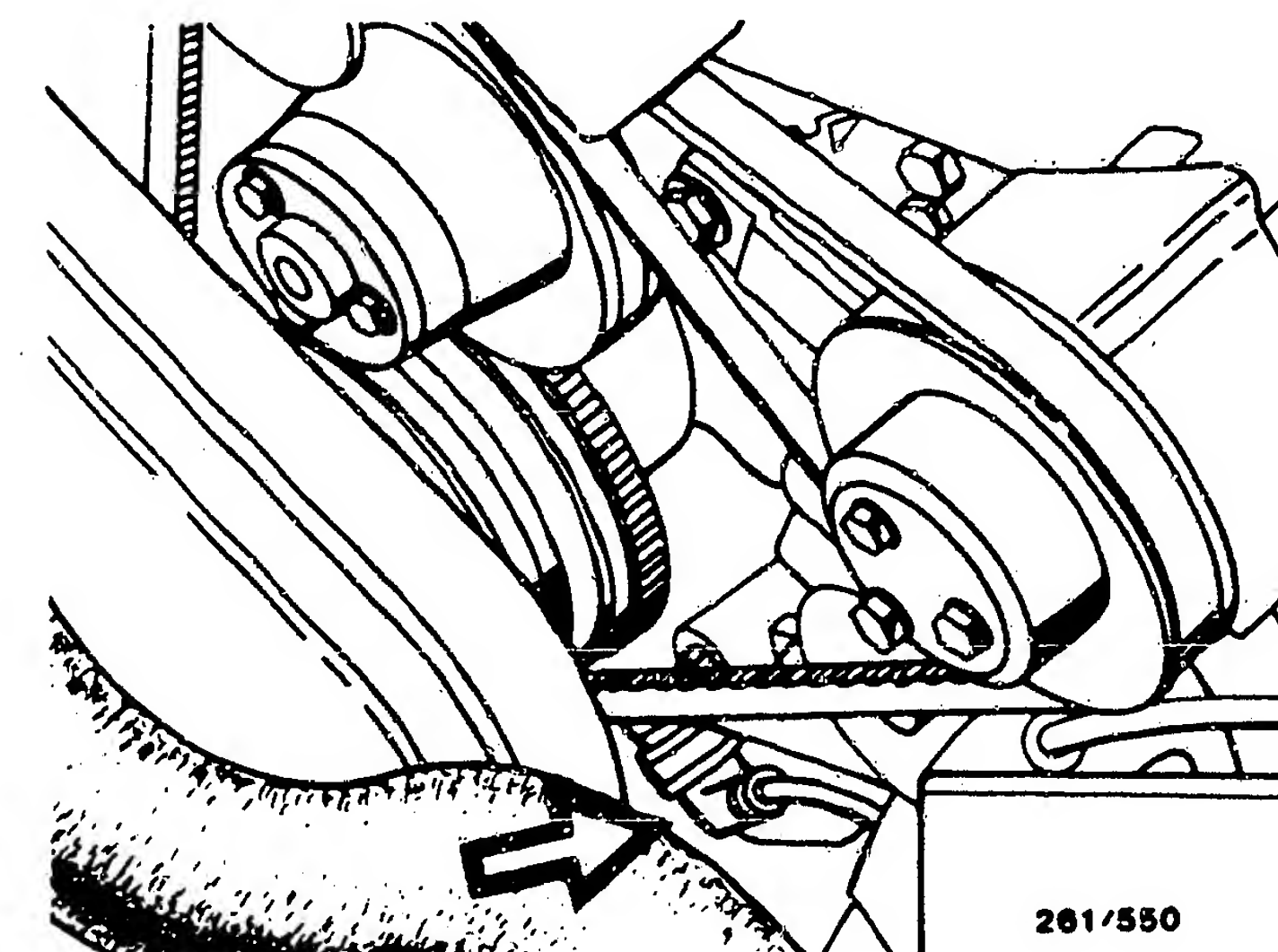
If sensor lead defective, replace sensor.



261/685

Top view of 35-pin control-unit plug of Motronic wiring harness

Alfa 75 Twin Spark S:
Arrow = Engine-speed/reference-mark sensor



261/550

Continued on next picture page

E05

<=>

E06

<=>

Check the following leads for open circuit with ohmmeter:

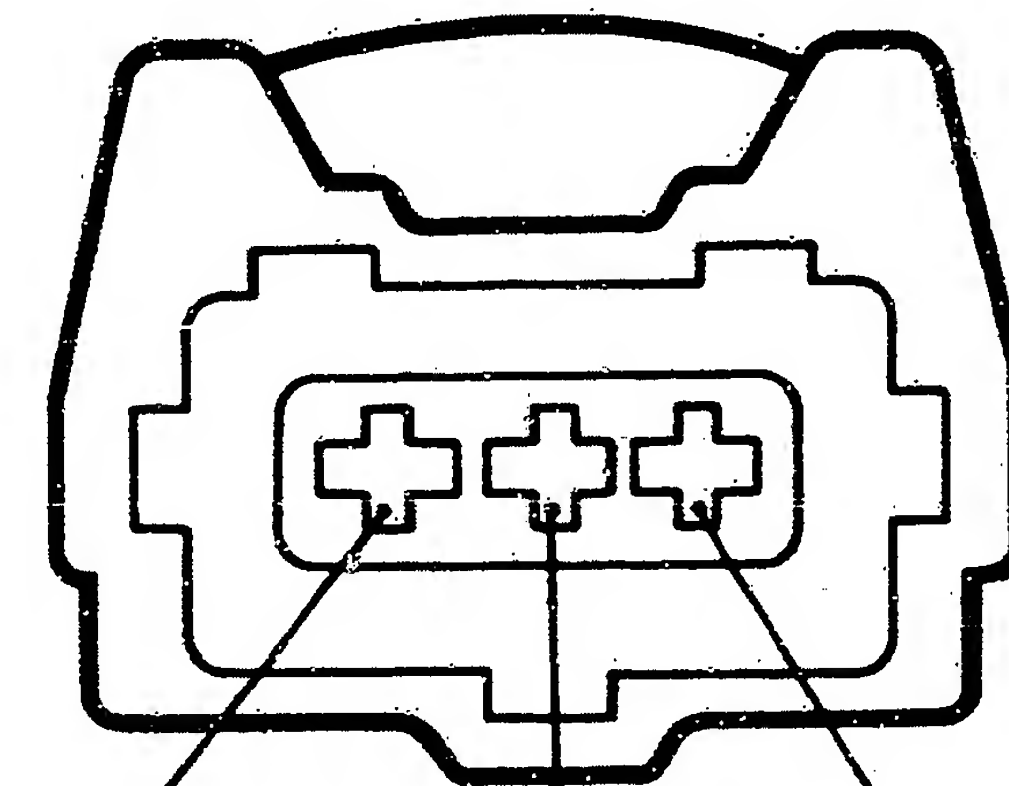
From control-unit plug term. 23 to sensor plug connector term. 2 and from control-unit plug term. 25 to sensor plug connector term. 1.

Set values: approx. 0Ω

Check plug for corrosion and loose contact.
Contacts must not allow themselves to be pushed back.

Set values obtained?
Contacts O.K.?

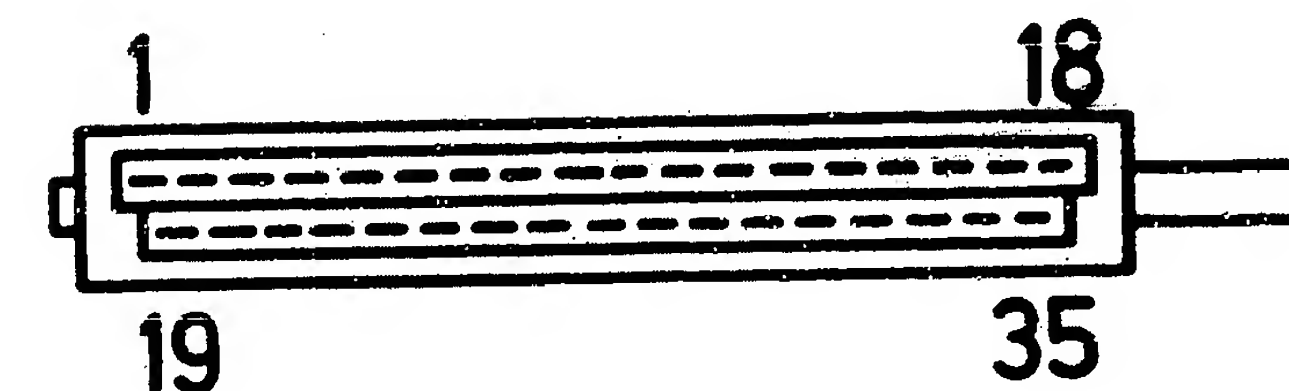
Repair defective lead/plug.



Kl.1(25) Kl.2(23) Kl.3 261/671

Top view of plug of engine-speed/reference-mark sensor
Term. 3 = Shielding lead

Top view of 35-pin control-unit plug of Motronic wiring harness



261/685

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (6) CONTINUED (3)

Check signal from engine-speed/
reference-mark sensor.

Take apart sensor plug
connector.

Set motortester to special
input.

Lever at left-hand stop
(calibrated voltage range).

Connect special cable to plug
of sensor:

Red tester clamp to term. 1
of sensor plug, black tester
clamp to term. 2 (negative,
center contact).

Start engine.

Set value: See top picture.

Read off voltage.

N o t e:

With the reference-mark
signal, the negative amplitutde
must appear first.

Signal O.K.?

N>

1. No signal or signal
too small:

Measuring leads incorrectly
connected.

Cranking speed less than
200 min-1:

Charge battery.

Sensor air gap too big.

Nominal air gap:

0,8 mm \pm 0.3.

Sensor mechanically defective,
replace.

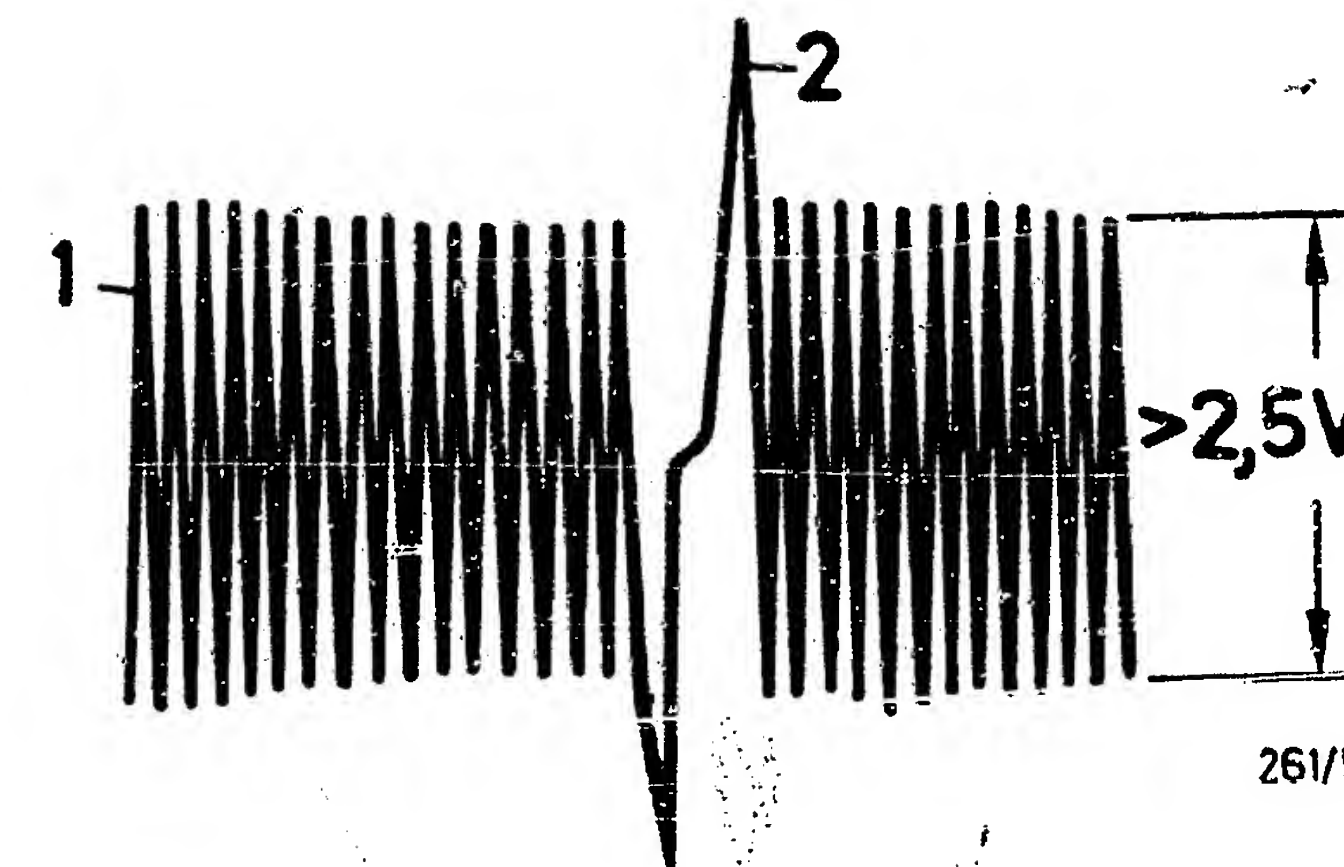
2. Incorrect signal:

Ring gear defective.

Note: Reference-mark signal
is formed by several missing
teeth in succession.

Positive amplitude appearing
first: measuring leads
incorrectly connected or sensor
leads to control unit mixed
up.

Rectify in accordance with
circuit diagram.



261/578

1 = Engine-speed signal
2 = Reference-mark signal

Return to trouble-shooting chart
B03

Continued on next picture page

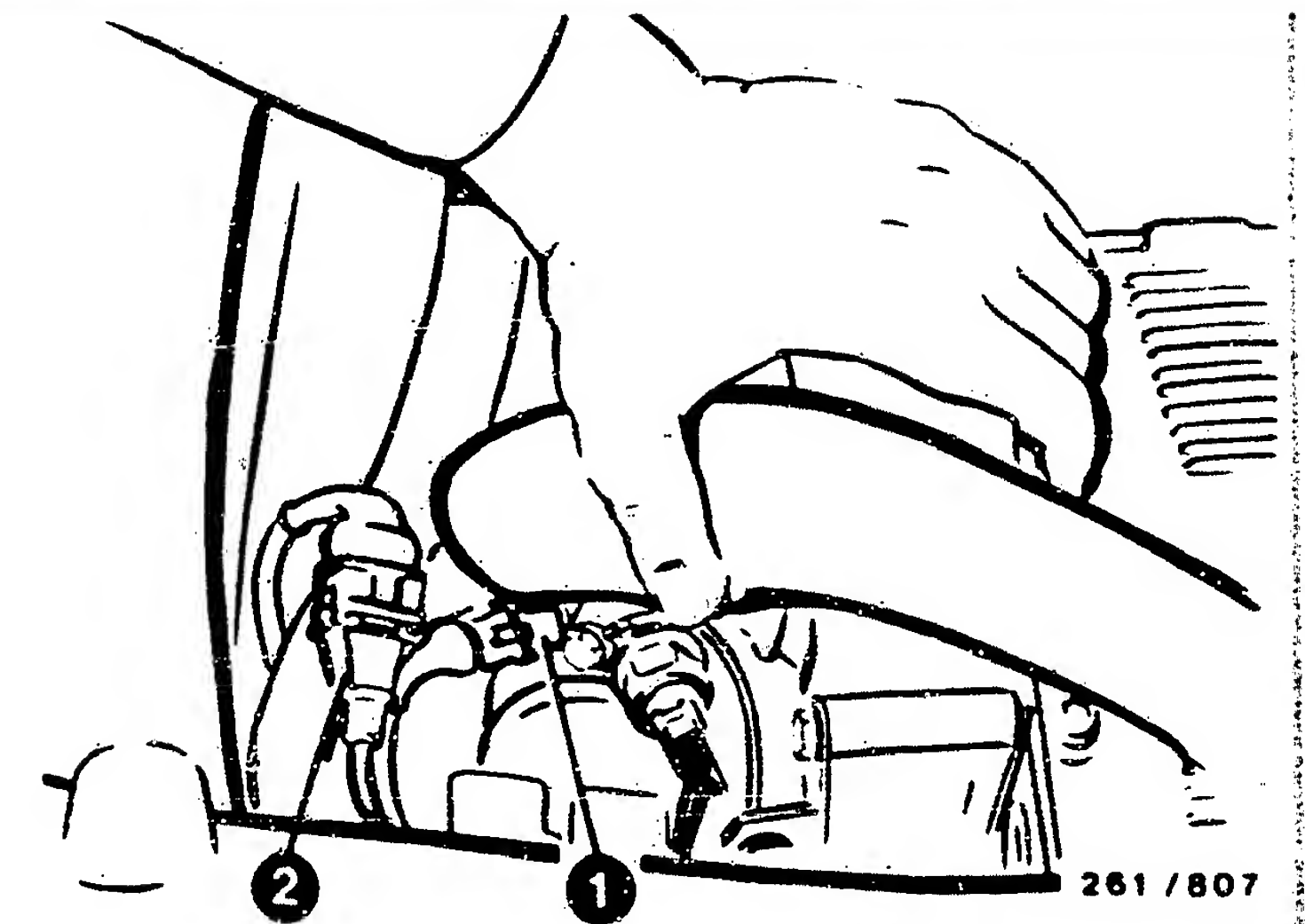
Sensor defective -> replace.

Notes on replacement:

Unscrew fastening screw and withdraw sensor. If stiff, help by turning and with screwdriver.

Do not take sensor out of protective sleeve until just before installation.
Before installing the sensor, make sure that there are no metallic parts sticking to the sensor (sensors contain permanent magnets).
Grease sensor with Longterm 2.
Press sensor by hand into the hole as far as it will go. Do not use force. Do not knock.
Make sure that the spring contacts in the plug are correctly seated. Spring contacts must not allow themselves to be pushed back and must be free from corrosion. Plug connector must latch in.

Return to trouble-shooting chart B03



Alfa 164 3.0 V6:

- 1 = Temperature sensor (engine)
- 2 = Plug connection of engine-speed/reference-mark sensor

TROUBLE-SHOOTING PROGRAM (7)

Check fuel pressure with engine stopped.

Measure pressure before pressure regulator. Measuring point at inlet of fuel-distribution pipe, at hose connection or at pressure damper (if applicable)

Loosen fuel-inlet hose.

CAUTION!

Catch escaping fuel; it must not get onto hot parts of the engine. Connect pressure tester KDJE-P100. Close valve screw. To connect, use three-way line KDJE-P100/13 (hose connection) or connecting part KDJE-P100/14 (screw connection M 14 x 1.5). Make sure there are no leaks. Connect jumper into connection base (for pump relay) between term. 87 and term. 30. The electric fuel pump must operate.

Fuel pressure

SET VALUE: see brief instructions

Set value obtained?

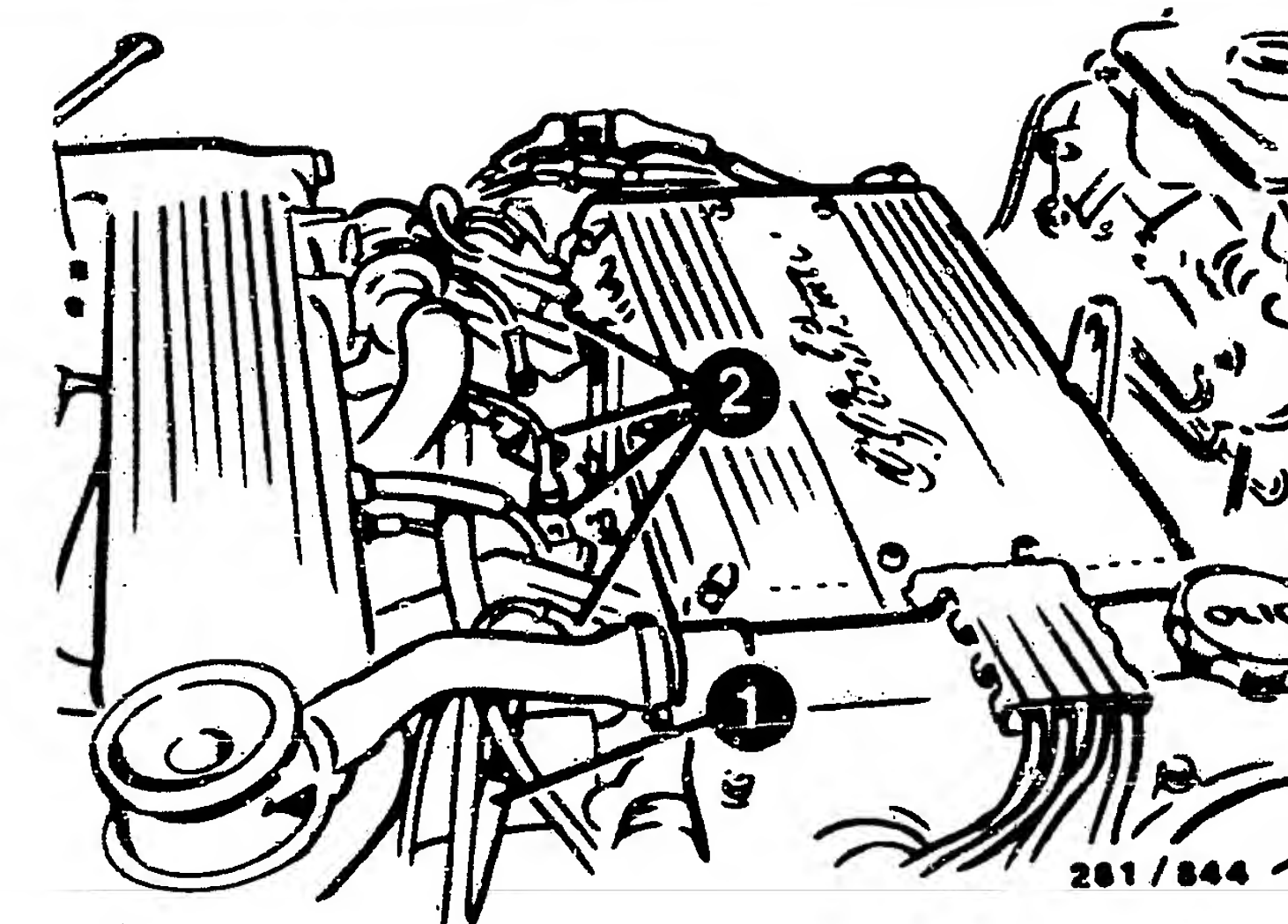
N>

Set value is not attained:

- * Test pump fuse
- * Replace pump relay
- * Measure voltage at detached pump connections.

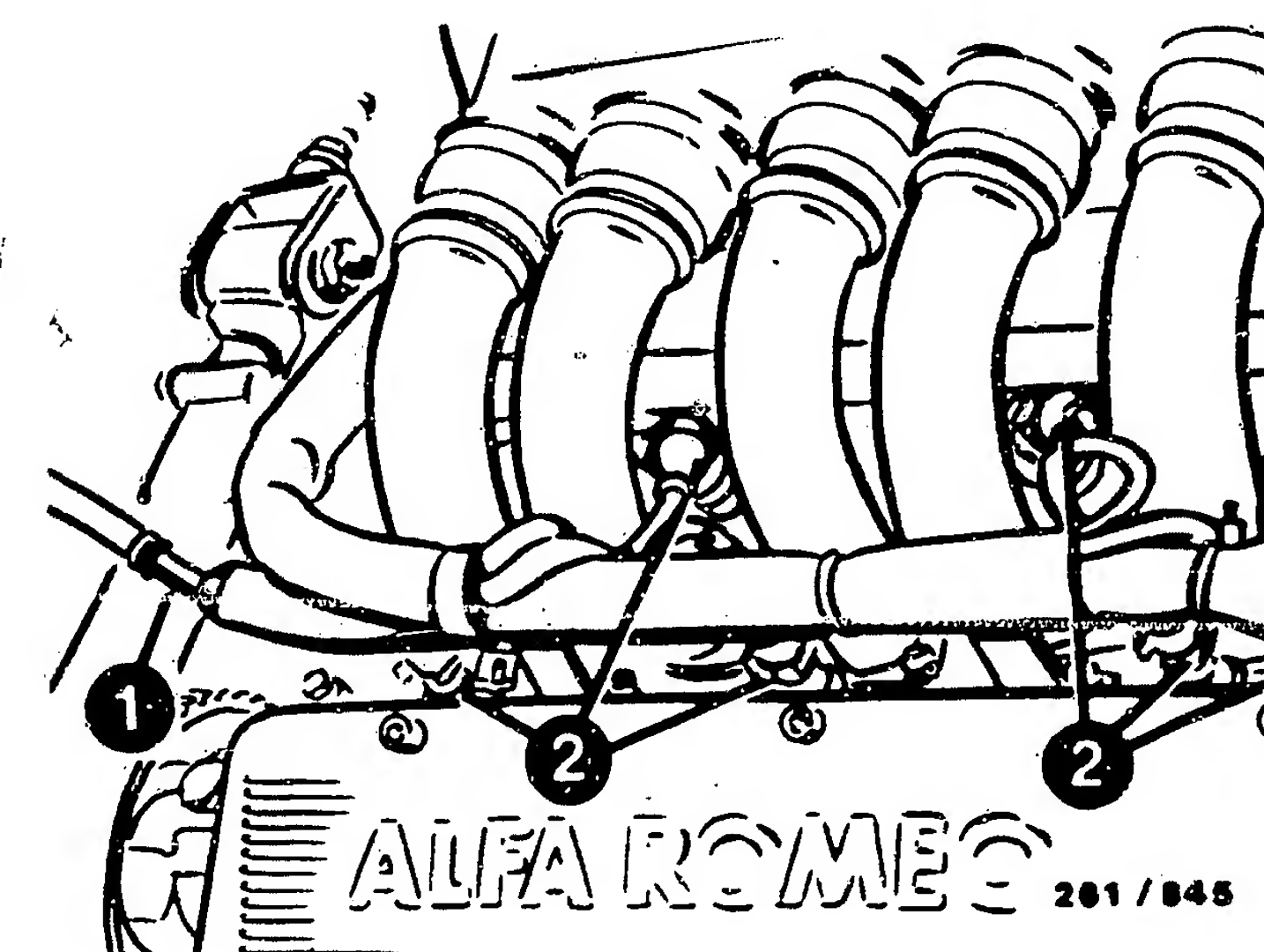
No voltage, test positive lead from fuel pump to pump relay term. 87 as well as pump ground lead.

If voltage present, test pressure regulator and fuel pump (see next picture page).



Alfa 75 Twin Spark S:
1=Connection point for fuel pressure measurement
2=Solenoid-operated injection valves

Alfa 164 3.0 V6:
1=Connection point for fuel pressure measurement
2=Solenoid-operated injection valves



Continued on next picture page

Continued on next picture page

V

Set value is dropped below:

- * Slowly pinch off fuel return line.
Caution! Pressure must not increase to in excess of 6 bar.
If pressure increases to in excess of 5 bar, renew pressure regulator.
With O-ring sealing technique, use new O-rings.
Apply small quantity of silicon grease (Ft 2 v 1).
If pressure does not increase sufficiently, fuel pump is defective.
- * Fuel filter heavily clogged, renew.
- * Fuel pressure line or pressure damper (if applicable) clogged, renew.
- * Filter in tank clogged.
Corrosion in tank.

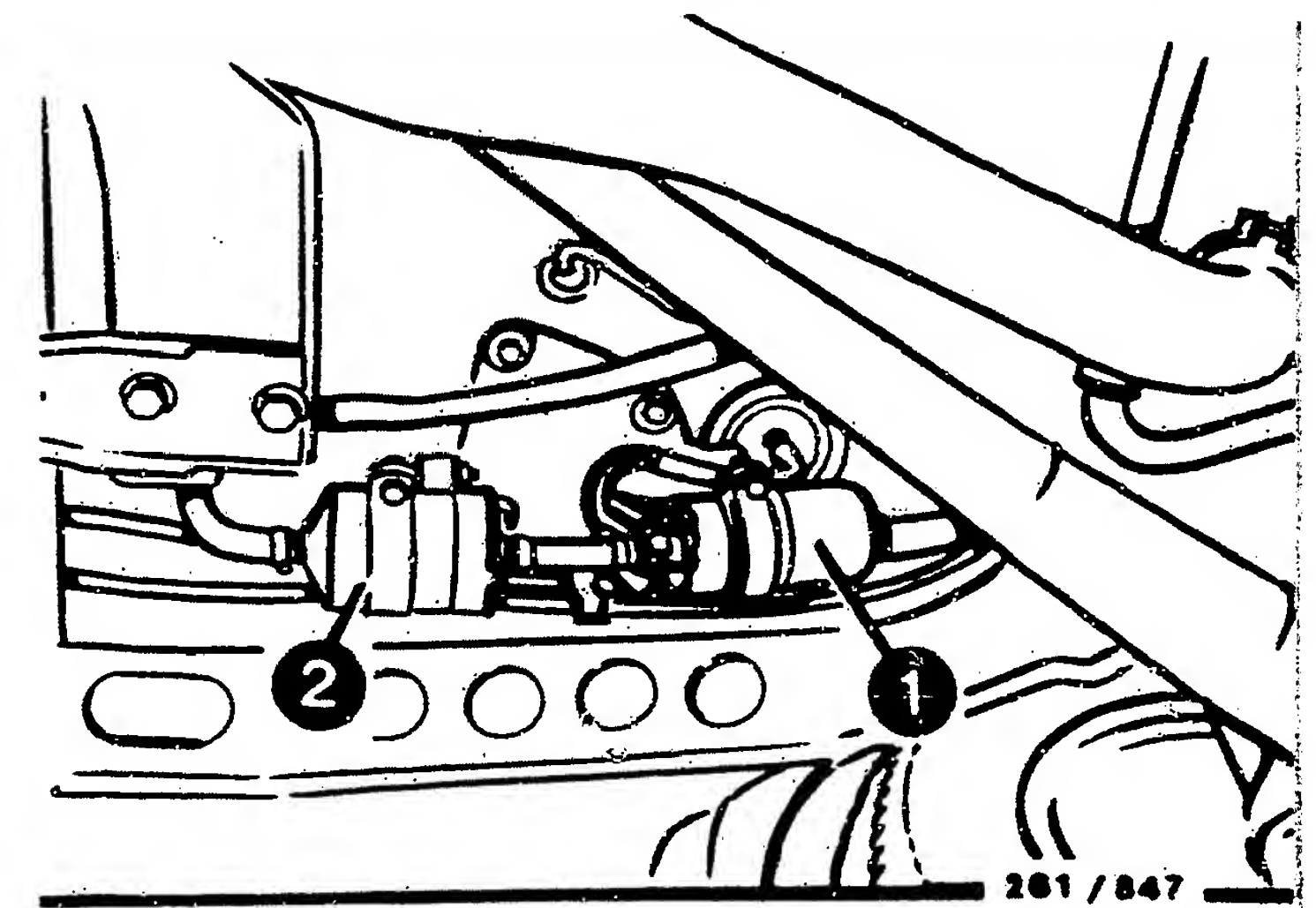
Set value is exceeded:

Detach fuel return hose from pressure regulator.
Attach test hose to pressure regulator and route it into a 1.5 l measuring jug.
Is set value now attained?

1. If yes, fuel return line clogged or squashed; renew.
2. If no, pressure regulator defective; renew.

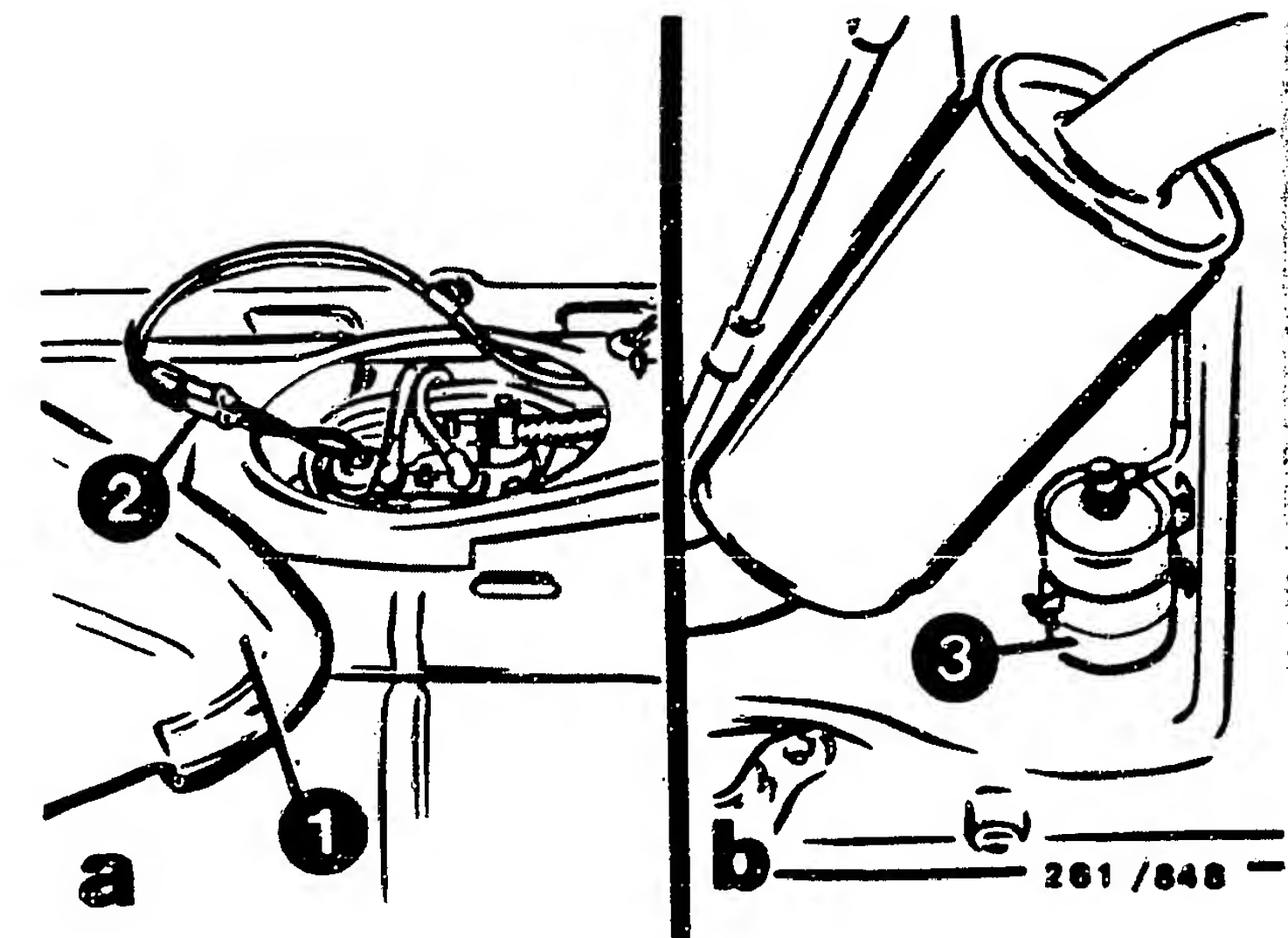
V

Continued on next picture page



Alfa 75 Twin Spark S:
1 = Electric fuel pump
2 = Fuel filter

Installation position of
in-tank electric fuel pump
(left) and fuel filter
(right)
in Alfa 164 3.0 V6.
1 = Cover (in trunk)
2 = Plug connection to
fuel pump
3 = Fuel filter



261/848

TROUBLE-SHOOTING PROGRAM (7) CONTINUED (2)

Check fuel pressure with engine running.

Let engine idle.

Fuel pressure
SET VALUE: approx. 0.5 bar
lower than with engine stopped.

Set value obtained?

N>

*Intake-manifold-pressure energization of pressure regulator not O.K. Hose line between pressure regulator and intake manifold clogged or leaking → replace.
Hose line dropped off → re-connect.

*If intake-manifold-pressure energization O.K. → replace pressure regulator.

Check fuel pressure after switching off engine (checking for leaks).

Fuel pressure
SET VALUE: min. 1.0 bar
after 20 minutes.

Set value obtained?

N>

*Leaking at joints between components, fuel hoses and fuel lines → tighten hose binder or replace hose.

*Pressure regulator (diaphragm) leaking → replace.

*Electric fuel pump (non-return valve) leaking.
With screw-type non-return valve → replace.
With integral non-return valve → replace electric fuel pump.

*Pressure damper or fuel filter leaking → replace.

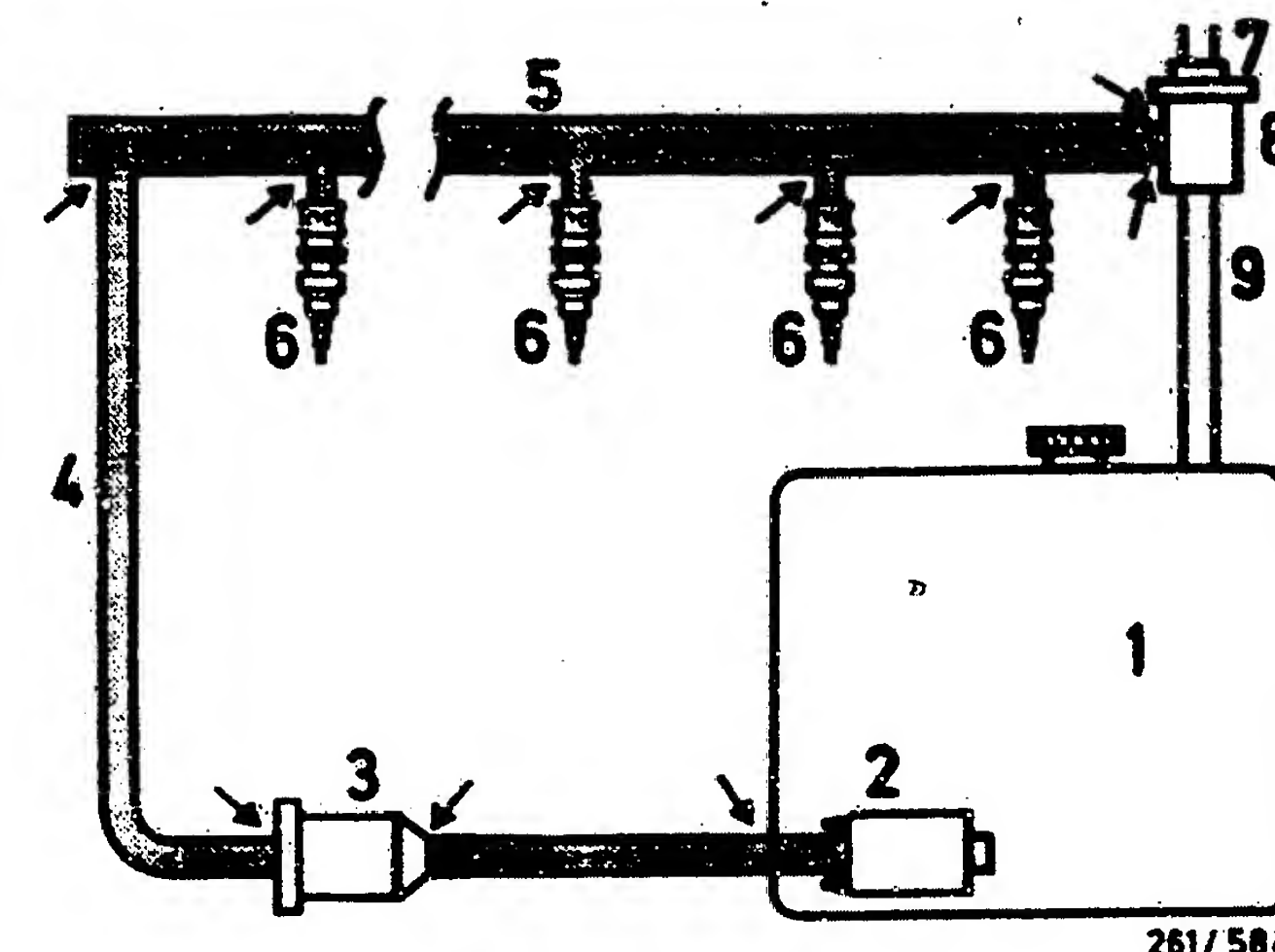
After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove pressure tester.
Connect fuel-inlet hose to fuel-distribution pipe.
Make sure there are no leaks.

Return to trouble-shooting chart B03

Continued on next picture page



- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Inlet, delivery line
- 5 = Fuel-distribution pipe
- 6 = Injection valves
- 7 = Intake-manifold pressure connection
- 8 = Pressure regulator
- 9 = Return line

Arrows = Possible leaks

*Leak in injection valve(s)
at point of connection with
fuel distributor; renew
O-ring. See text below.

*Check injection valve(s)
(needle seat) for leaks:

Remove complete fuel distributor.
Supply and return remain
connected. Simultaneously
pull all injection valves
out of intake-manifold guide.

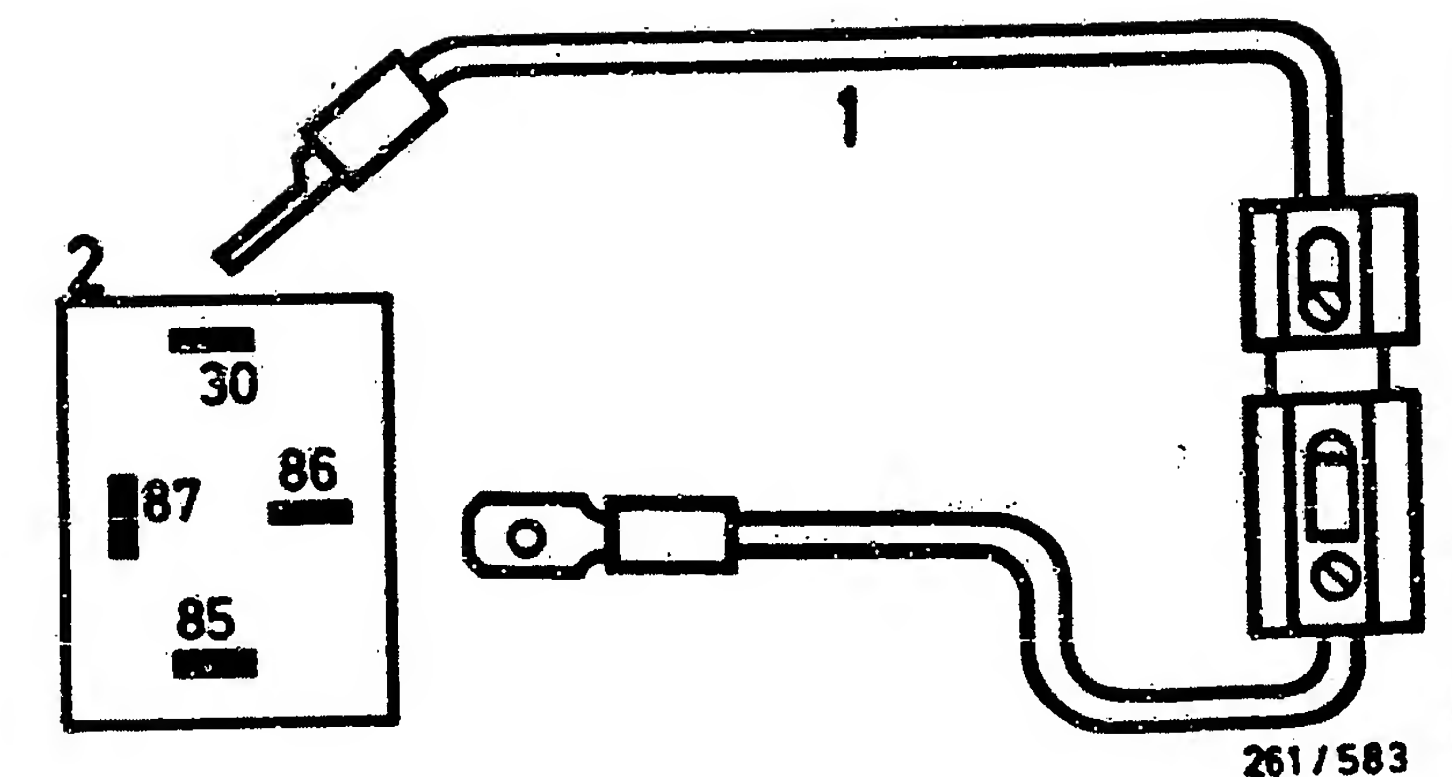
Fit jumper between term. 87
and term. 30 in connection
frame (pump relay).
Electric fuel pump must
run.

Set value:

No droplets may drip off the
injection valve within 60 s.
If they do so, renew injection
valve.

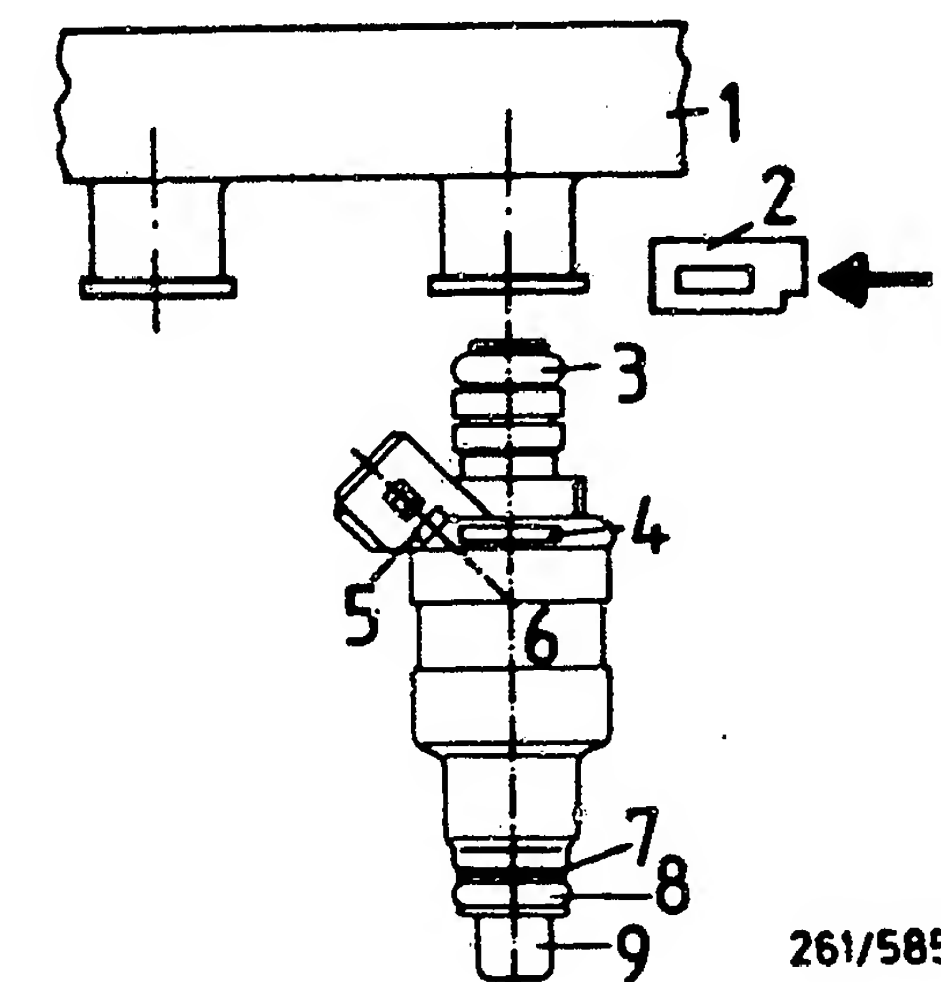
Removal:

Detach connector.
Pull out retaining clip.
Remove injection valve.
Caution!
Catch any fuel which emerges.
It must not be allowed to make
contact with hot engine components.



1 = Jumper with fuse holder
and 10 A fuse (user-
fabricated)
2 = Top view of connection
base

1 = Fuel-distribution pipe
2 = Holding clamp
3 = Upper O-ring
4 = Part number
5 = Date of manufacture
6 = Injection valve
7 = Supporting plate
8 = Lower O-ring
9 = Protective sleeve



Continued on next picture page

If injection valve (needle seat) is leakproof but O-ring is defective, then renew O-ring.

Use new parts set.
Caution! Do not damage protection sleeve and valve needle.

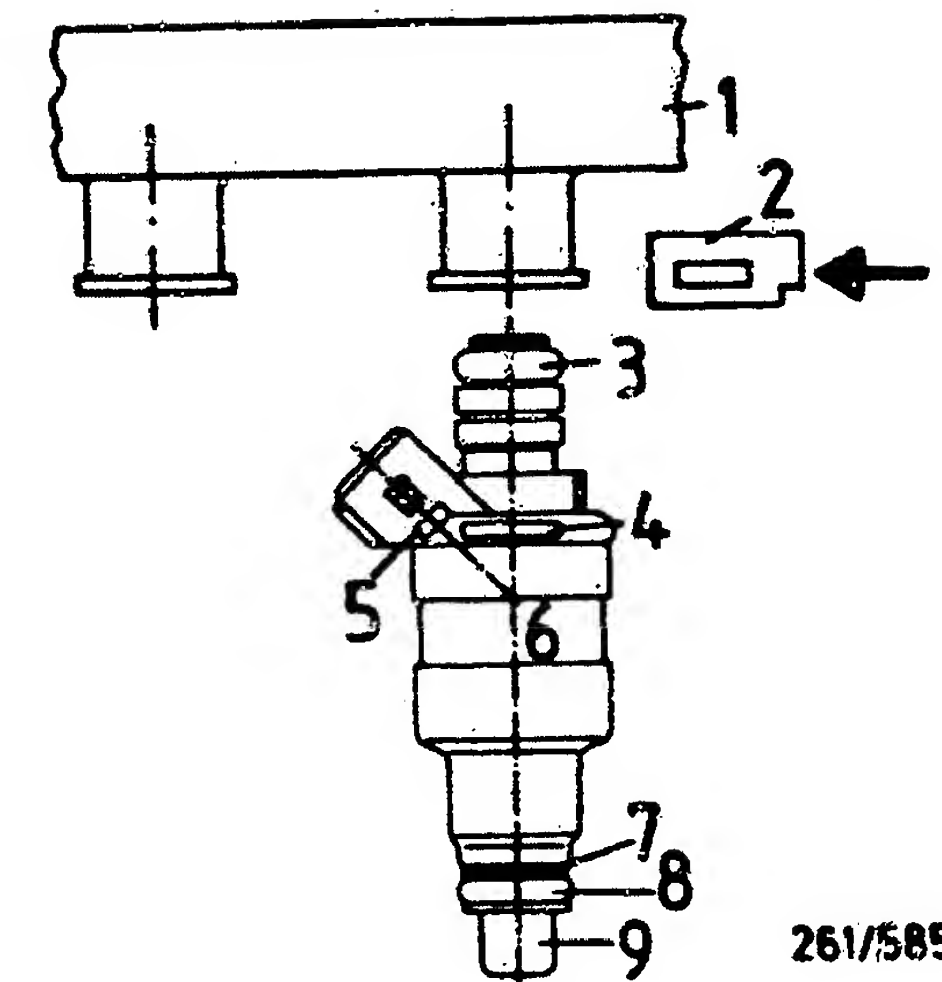
Renew upper O-ring (fuel distributor) if it is damaged.

Cut up lower O-ring (intake manifold) if it is defective.
Fit new O-ring over protection sleeve and its beading.

Installation:
Only grease O-rings slightly (silicone grease Ft 2 v 1).
Attach injection valve to fuel distributor.
Slip retaining clip into groove and allow it to engage.
Check for fuel leaks.
Fit connector.

Install complete fuel distributor.
In doing so, press all injection valves evenly into intake-manifold guide.
Caution!
Do not damage O-rings and/or valve needles.
Make sure there are no intake-manifold leaks.

Return to trouble-shooting chart
B03



261/585

- 1 = Fuel-distribution pipe
- 2 = Holding clamp
- 3 = Upper O-ring
- 4 = Part number
- 5 = Date of manufacture
- 6 = Injection valve
- 7 = Supporting plate
- 8 = Lower O-ring
- 9 = Protective sleeve

TROUBLE-SHOOTING PROGRAM (8)

Check fuel delivery.

Measure fuel delivery of electric fuel pump against pressure. Therefore, measuring point at return, after pressure regulator.

Disconnect fuel-return hose from pressure regulator. Mount test hose on pressure regulator and lead into a 1.5 l measuring glass.

Disconnect pump relay.

Connect jumper into connection base between term. 87 and term. 30.

The electric fuel pump must operate. Measuring time 30 sec.

Fuel delivery

SET VALUE: See brief instructions

Set value obtained?

After testing is finished:

Remove jumper and connect pump relay in connection base.

Remove test hose and mount fuel return hose on pressure regulator. Make sure there are no leaks.

Return to trouble-shooting chart B03

N>

*Fuel filter heavily soiled, replace.

*Fuel pressure line or pressure damper (if fitted) blocked, replace.

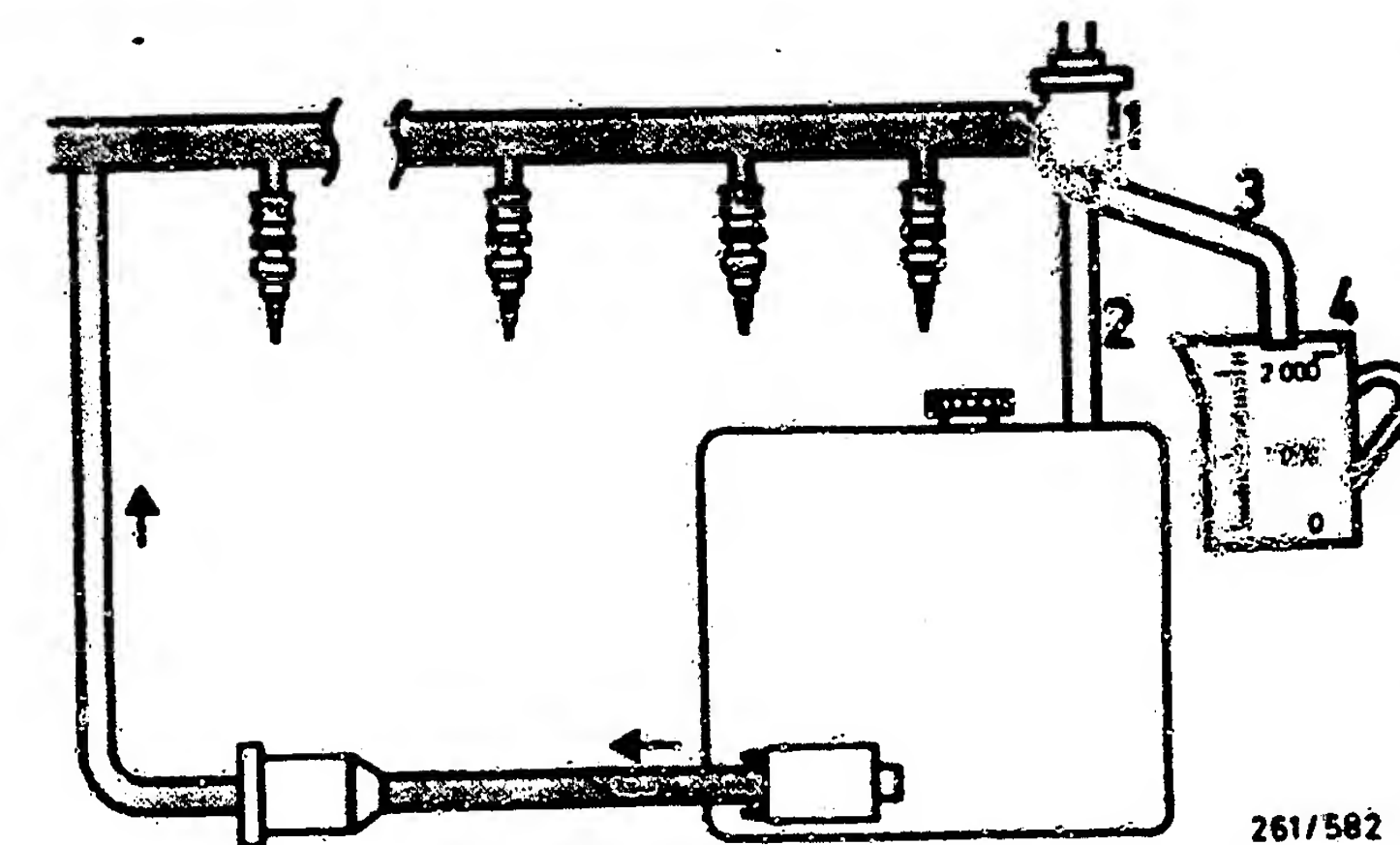
*Voltage at electric fuel pump with engine running, min. 12 V. If not, clean contacts, remedy poor ground connection, replace leads.

*Check pre-supply pump (if fitted). Measuring point: Line between the pumps. Delivery quantity must be at least 10% greater than that of electric fuel pump. If not, replace pre-supply pump.

*If fuel-pump output is too low, replace electric fuel pump, clean connecting points before separation to prevent dirt from entering fuel system. In-tank electric fuel pumps are accessible via a plug on the tank.

*If electric fuel pump is noisy (vapor bubbles), suction line restricted or kinked, replace. Strainer in tank blocked, replace. Corrosion in tank, clean or replace.

*Pressure reg. defective, check.



Pressureless

Fuel pressure

1 = Pressure regulator

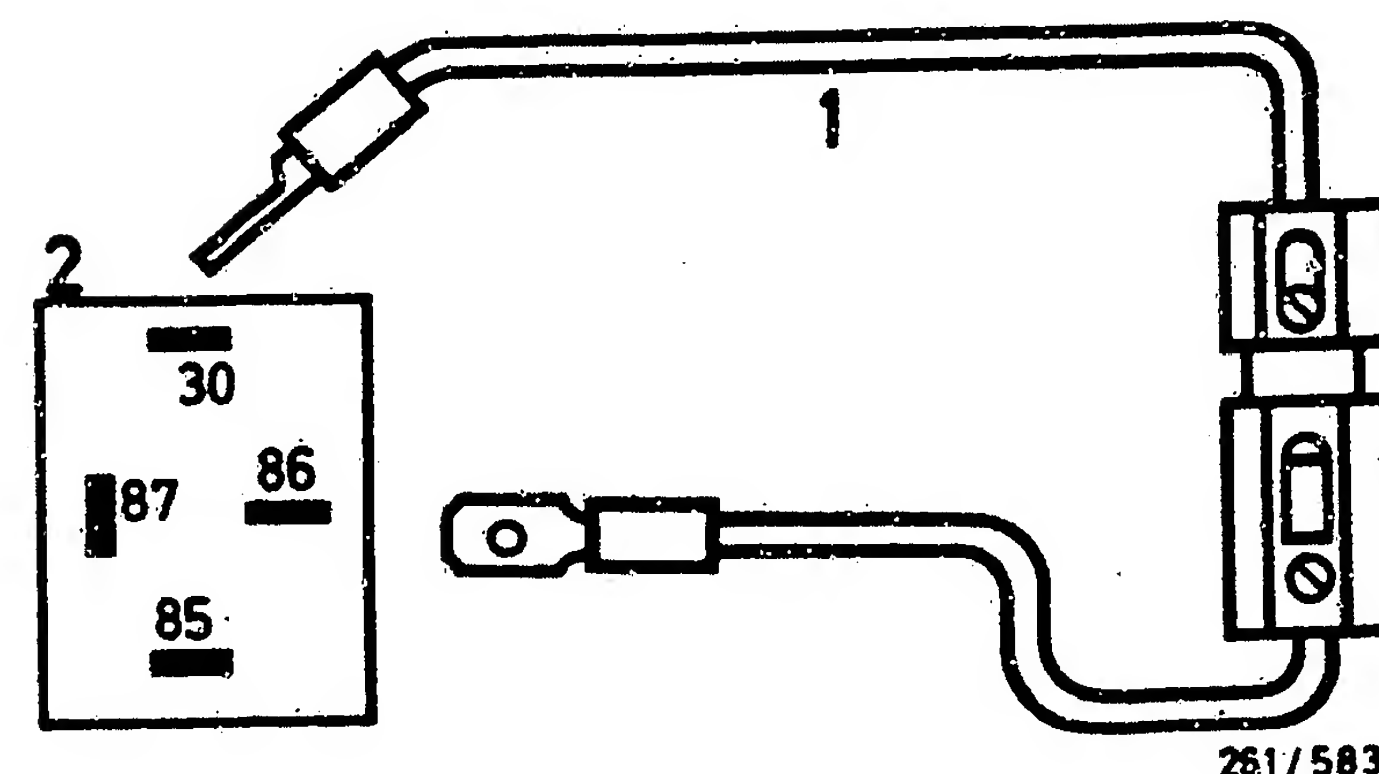
2 = Return

3 = Test hose

4 = Measuring glass

1 = Jumper with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection base



TROUBLE-SHOOTING PROGRAM (9)

* Mechanical check of air-flow sensor:

Remove air-flow sensor.

Open sensor flap by hand.

Sensor flap must open with uniform ease as far as it will go and must automatically close again as far as it will go.

Sensor flap must not catch when opening.

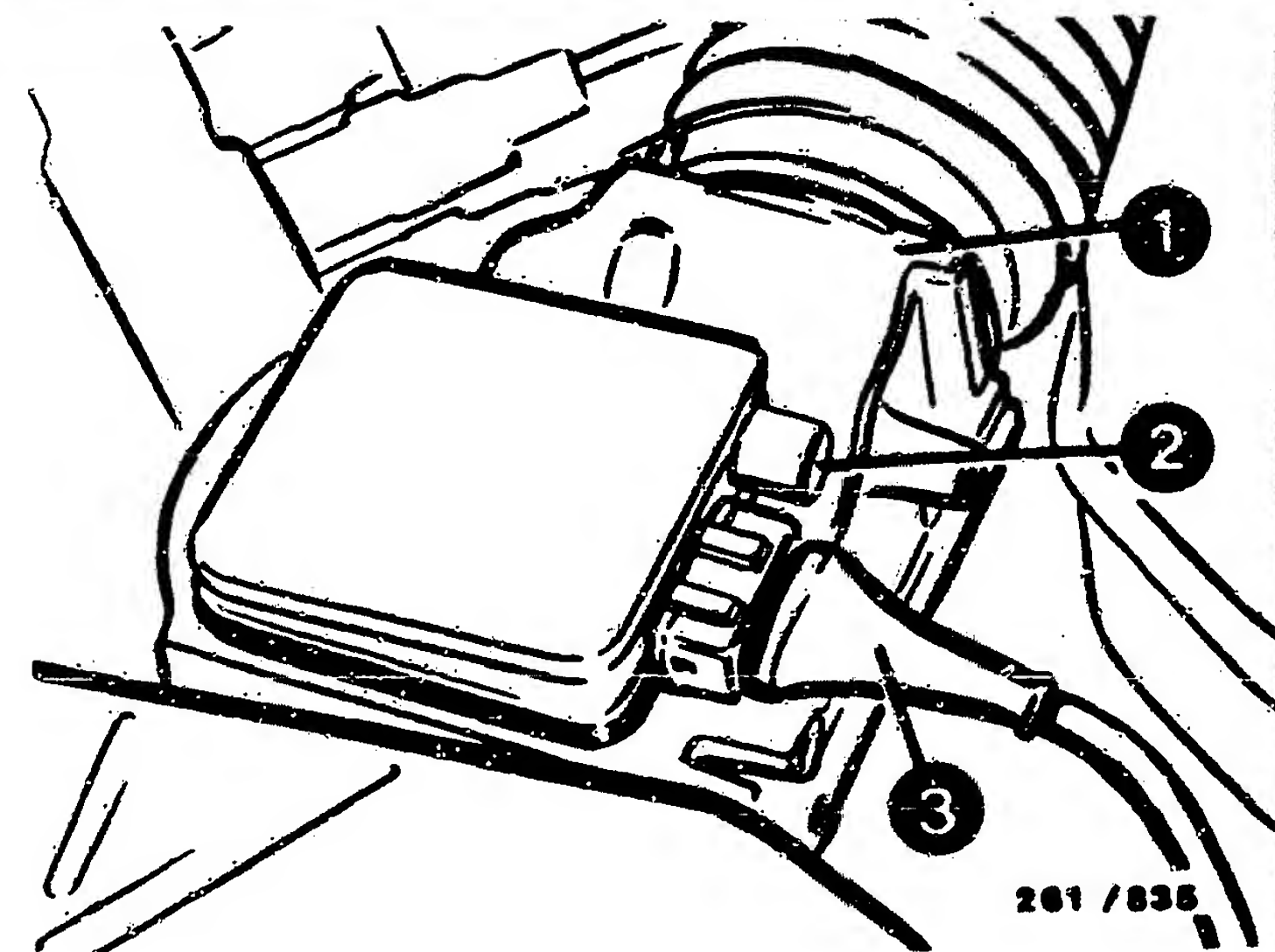
Watch for signs of rubbing.

Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth.

Does sensor flap open with uniform ease?

No signs of rubbing visible?

Replace air-flow sensor.



1 = Air-flow sensor

2 = CO potentiometer

3 = Plug of air-flow sensor

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (9) CONTINUED (1)

Electrical test of air-flow sensor:

Remove air-flow sensor.

Leave plug on. Push back rubber sleeve on plug.
Connect voltmeter to plug term. 2(+) and term. 4(-) with test prods.
Switch on ignition.
Measure voltage.

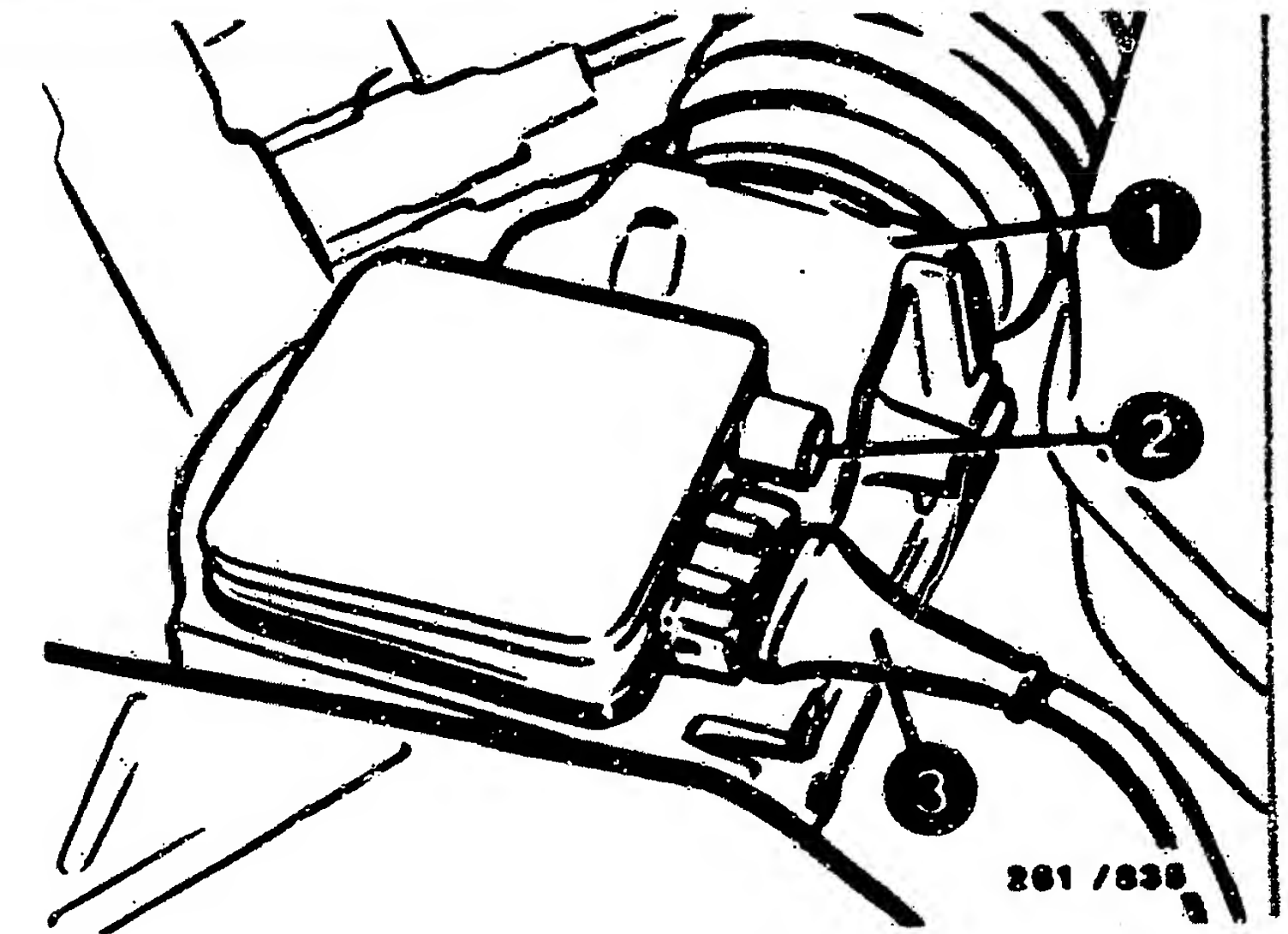
SET VALUES:

Sensor flap in rest position:
200...300 mV

Open sensor flap by hand as far as it will go:
greater than 4,2 V

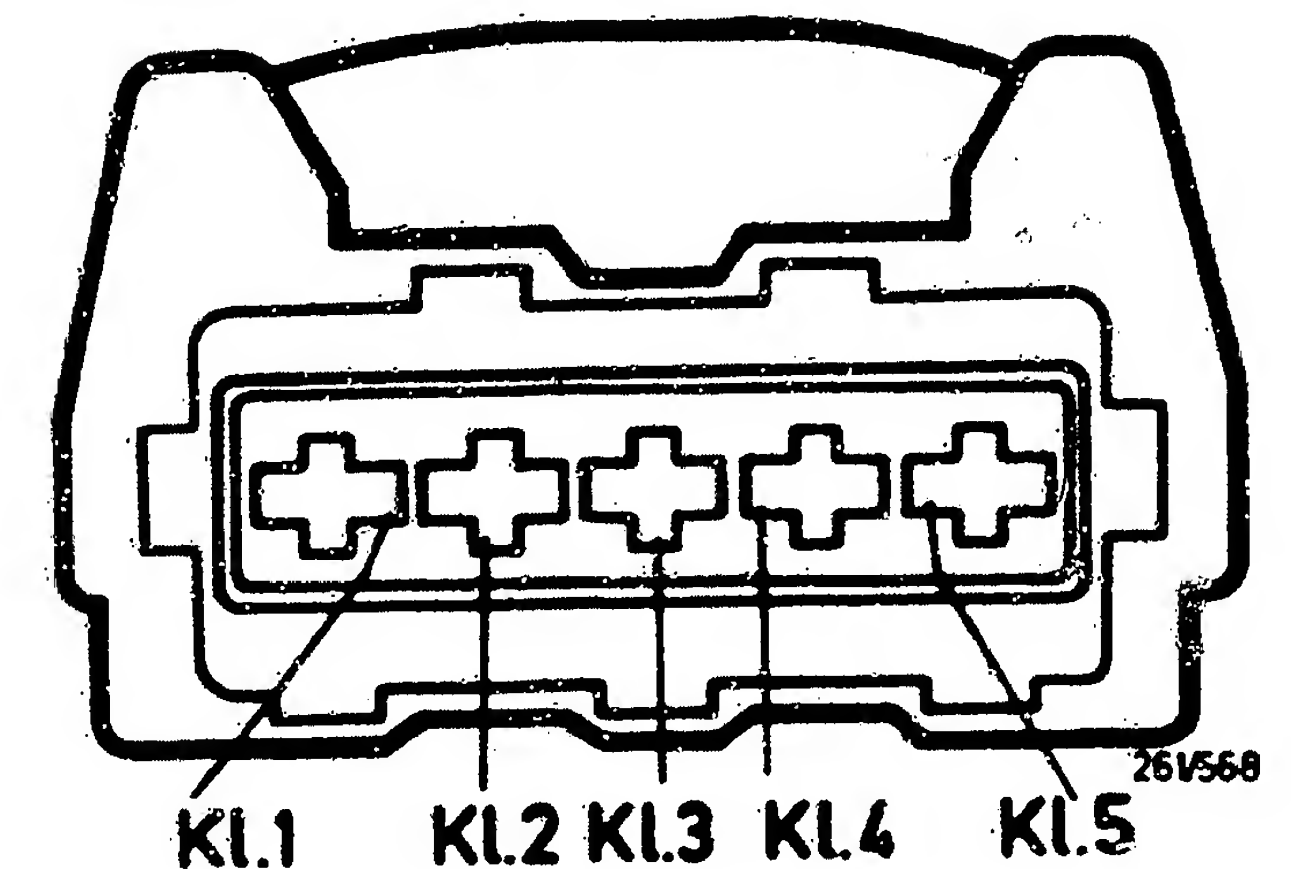
Set values obtained?

Replace air-flow sensor.



- 1 = Air-flow sensor
- 2 = CO potentiometer
- 3 = Plug of air-flow sensor

Top view of plug for air-flow sensor



Continued on next picture page

Check potentiometer in air-flow sensor with oscilloscope (noise test).

* Remove air-flow sensor. Leave electric plug on. Push back rubber sleeve. Set motortester to special input, and, using the special cable, connect to air-flow sensor at term. 2, red clip, and at term. 4, black clip.

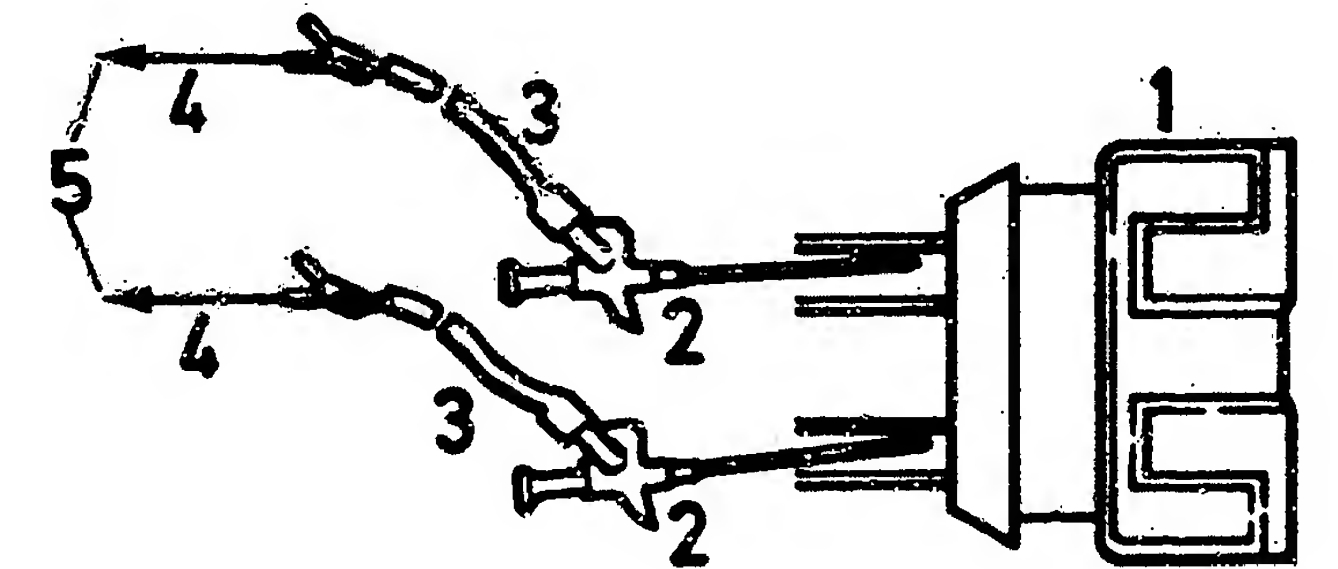
* User-fabrication of adapter lead: Two approx. 1 m long leads, approx. 1 mm ² cross section.

2 measuring prods are attached to one end. At the other end, strip off approx. 2 cm insulation and connect to the clamps of the special-input connecting lead.

C a u t i o n:

Insulate bare connecting points of adapter lead (risk of short circuit).

Measure carefully into the plug of the air-flow sensor. Do not bend spring contacts. Set control lever for image adjustment on motortester all the way to the left (calibrated setting).



261/598

- 1 = Air-flow sensor plug
- 2 = Test prod
- 3 = Adapter lead (User-fabricated)
- 4 = Special-input connecting lead
- 5 = Motortester special input

Continued on next picture page

TROUBLE-SHOOTING PROGRAM (9) CONTINUED (3)

V

* Switch on ignition.

* Deflect air-flow sensor jerkily several times.

If air-flow sensor O.K., a continuous stroke signal must be visible on the oscilloscope.

If air-flow sensor defective, a noise signal will appear similar to the one shown opposite.

Disconnect adapter lead after testing and connect rubber sleeve properly.

Mount air-flow sensor.

Connect all hoses and tighten (no leaks).

Signal O.K.?

N>

Replace air-flow sensor.

V

Return to trouble-shooting chart B03

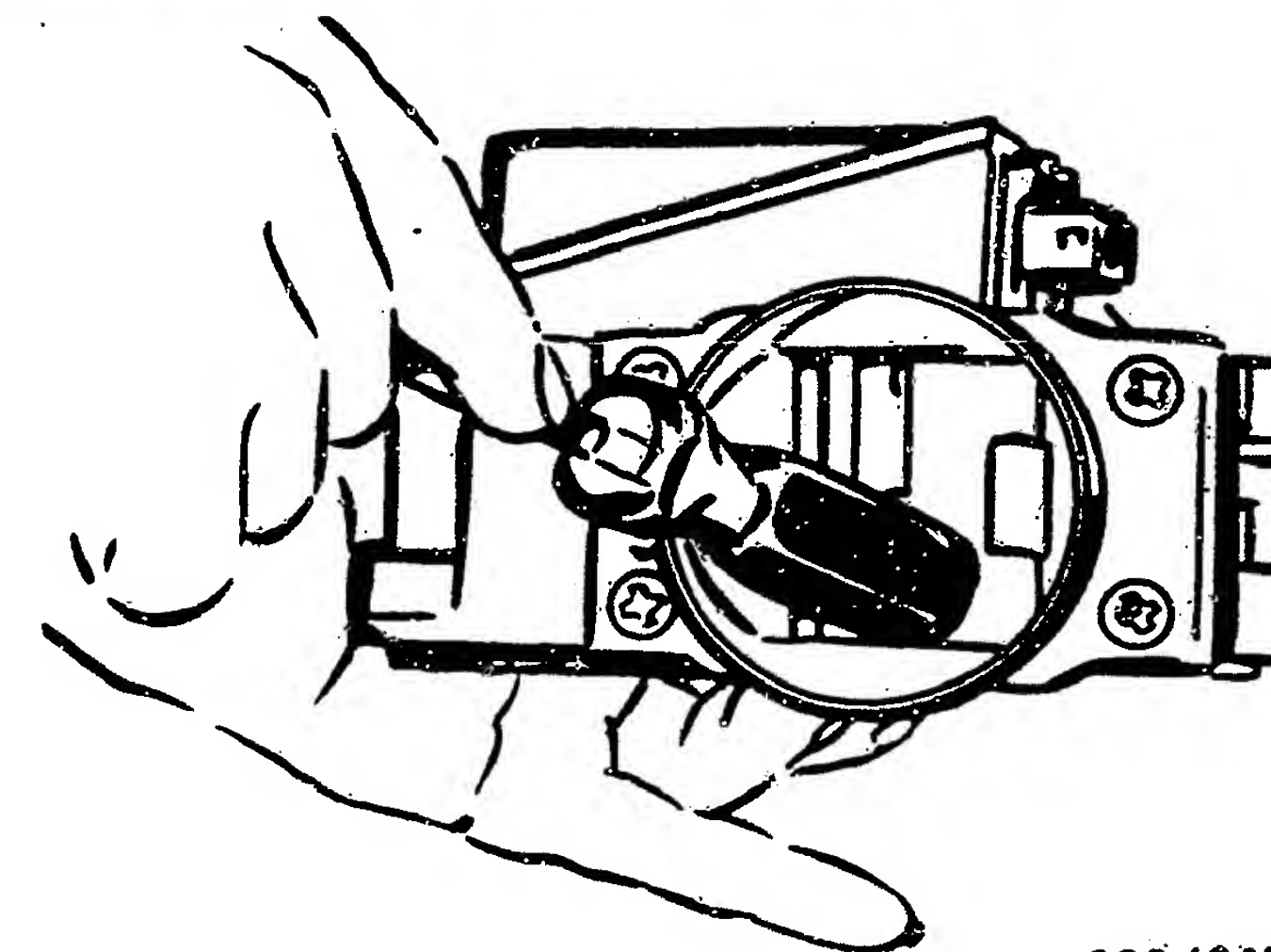
V

F03

<=>

F04

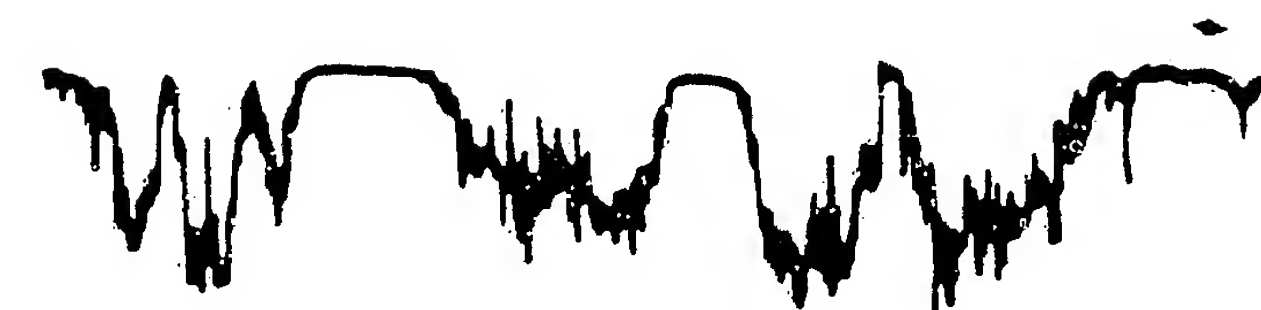
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280/0481

Opening the air-flow sensor flap

Noise signal if air-flow sensor defective



280/0264

TROUBLE-SHOOTING PROGRAM (10)

Check idle contact:

Disconnect plug from throttle-valve switch.

Throttle valve closed.

Connect ohmmeter to throttle-valve switch term. 2 and term. 18.

Set value: approx. 0Ω (continuity).

Open throttle valve:

Reading must change to infinity Ω after the throttle valve has been opened slightly.

Does resistance value change from 0Ω to infinity Ω ?

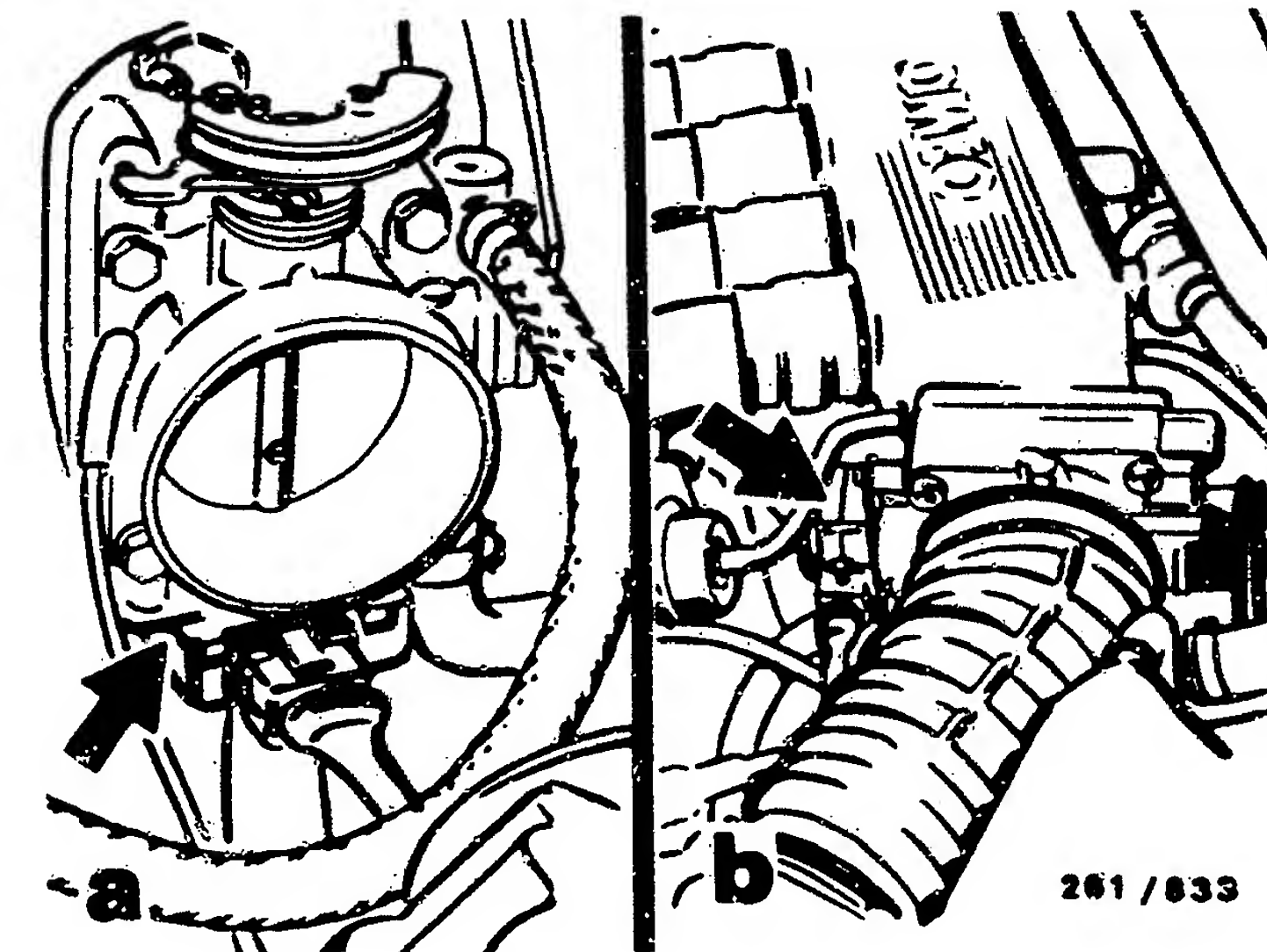
N>

* Idle contact not closing (reading remains constant at infinity Ω) or idle contact opening too late:
Adjust throttle-valve switch.
* Requirements for throttle-valve switch adjustment:
+ Throttle valve correctly adjusted? It must come up against the stop screw with the lever just before it sticks.
Lock screw against turning.
+ Adjust throttle cable/linkage free of tension.
If kinked \rightarrow replace.

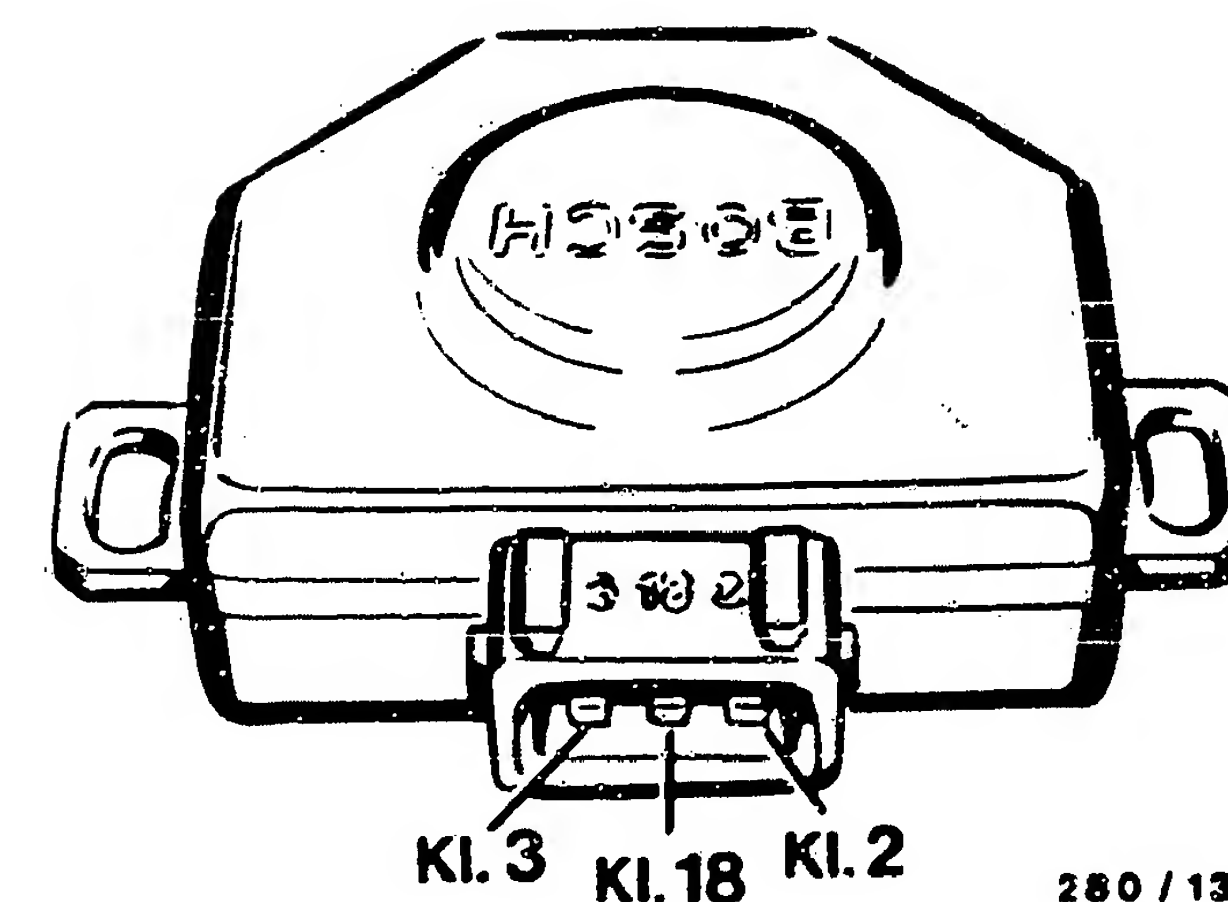
Adjusting the throttle-valve switch:
Slightly loosen fastening screws. Connect ohmmeter to throttle-valve switch between term. 2 and term. 18. Turn throttle-valve switch until the idle contact closes (microswitch clicks audibly). Reading 0Ω . If not \Rightarrow replace throttle-valve switch.

Checking the adjustment:
Pull slightly on throttle cable. Idle contact must open (microswitch clicks audibly).

Reading: Infinity Ω .



Picture a: Alfa 75 Twin Spark S
Picture b: Alfa 164 3.0 V6
Arrows = Throttle-valve switches



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (10) CONTINUED (1)

Check the following leads for open circuit with ohmmeter:
From control unit term. 2 to throttle-valve switch term. 2 as well as from throttle-valve switch term. 18 to ground.

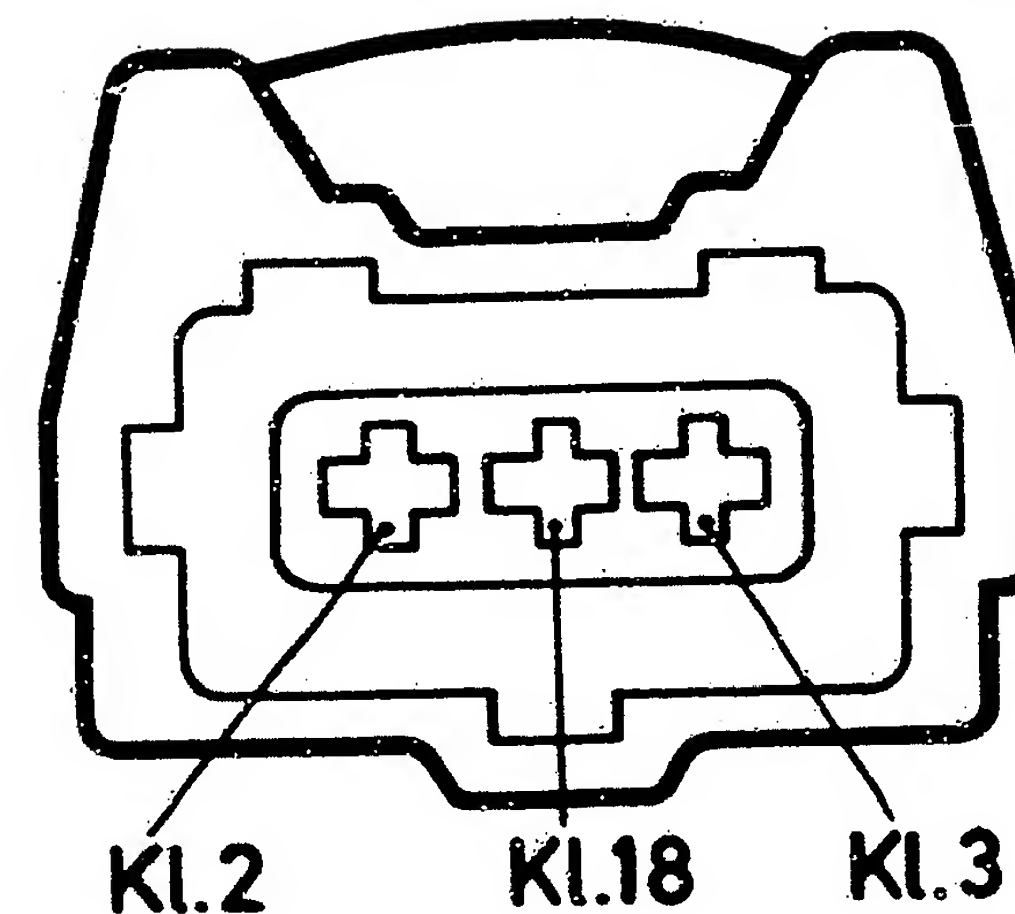
Set values: 0 Ω

Check plug for corrosion and loose contact. Contacts must not allow themselves to be pushed back.

Set values obtained?
Contacts O.K.?

N>

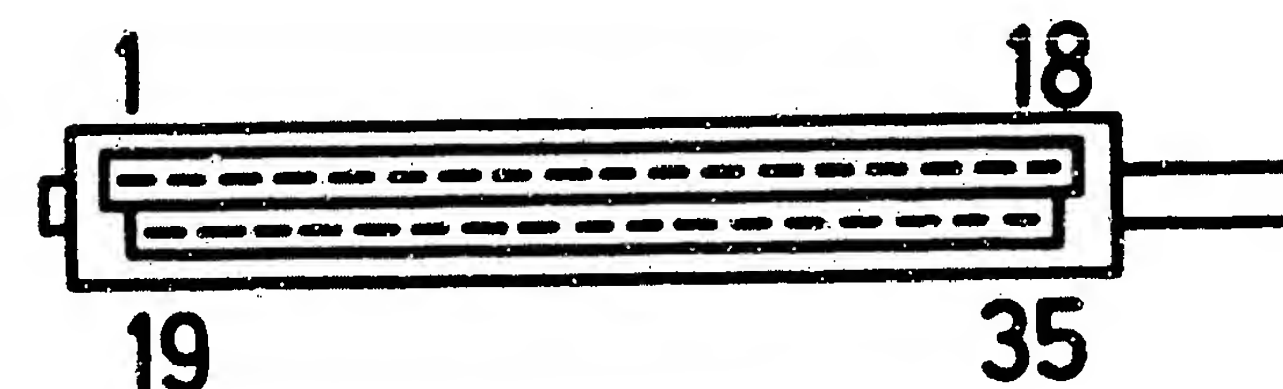
Repair defective lead/plug.



261/574

Throttle-valve-switch plug

Top view of 35-pin control-unit plug of Motronic wiring harness



261/685

Return to trouble-shooting chart B03

F07

<=>

F08

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TROUBLE-SHOOTING PROGRAM (11)

Check full-load contact:

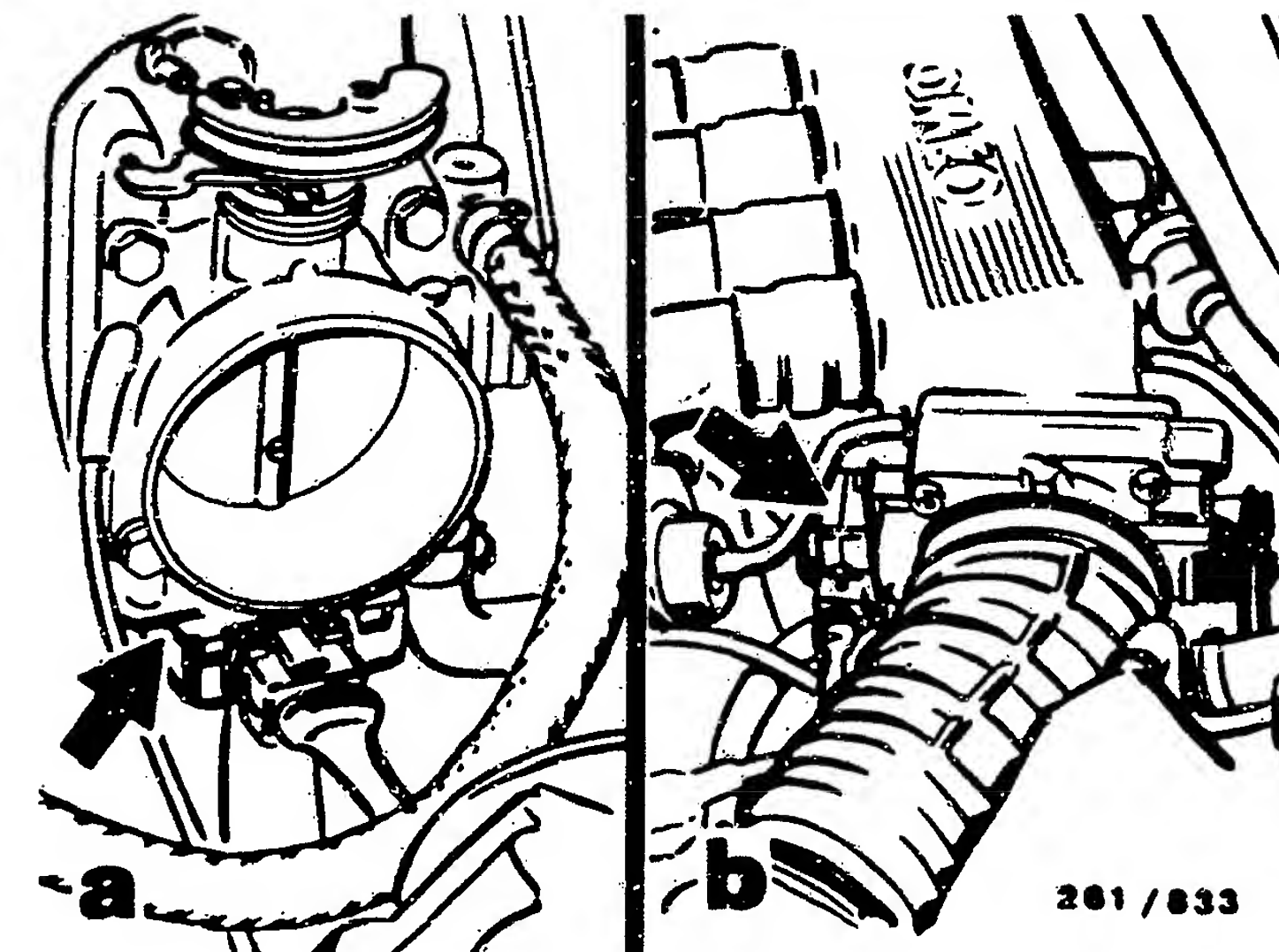
Disconnect plug from throttle-valve switch.
Connect ohmmeter to throttle-valve switch term. 3 and term. 18.
Open throttle valve as far as it will go:

Set value:
Before the full-load stop, the reading changes from infinity Ω to 0 Ω .

Does the reading change from infinity Ω to 0 Ω ?

N>

Full-load contact not closing (reading remains constant at infinity Ω):
Check whether throttle valve is mechanically able to open fully. If mechanics are O.K., replace throttle-valve switch.
N o t e:
The full-load contact cannot be adjusted. If the idle contact is correctly adjusted, the setting of the full-load contact will also be correct.



Picture a: Alfa 75 Twin Spark S
Picture b: Alfa 164 3.0 V6
Arrows = Throttle-valve switches

Check the following lead for open circuit with ohmmeter:
From control unit term. 3 to throttle-valve switch term. 3

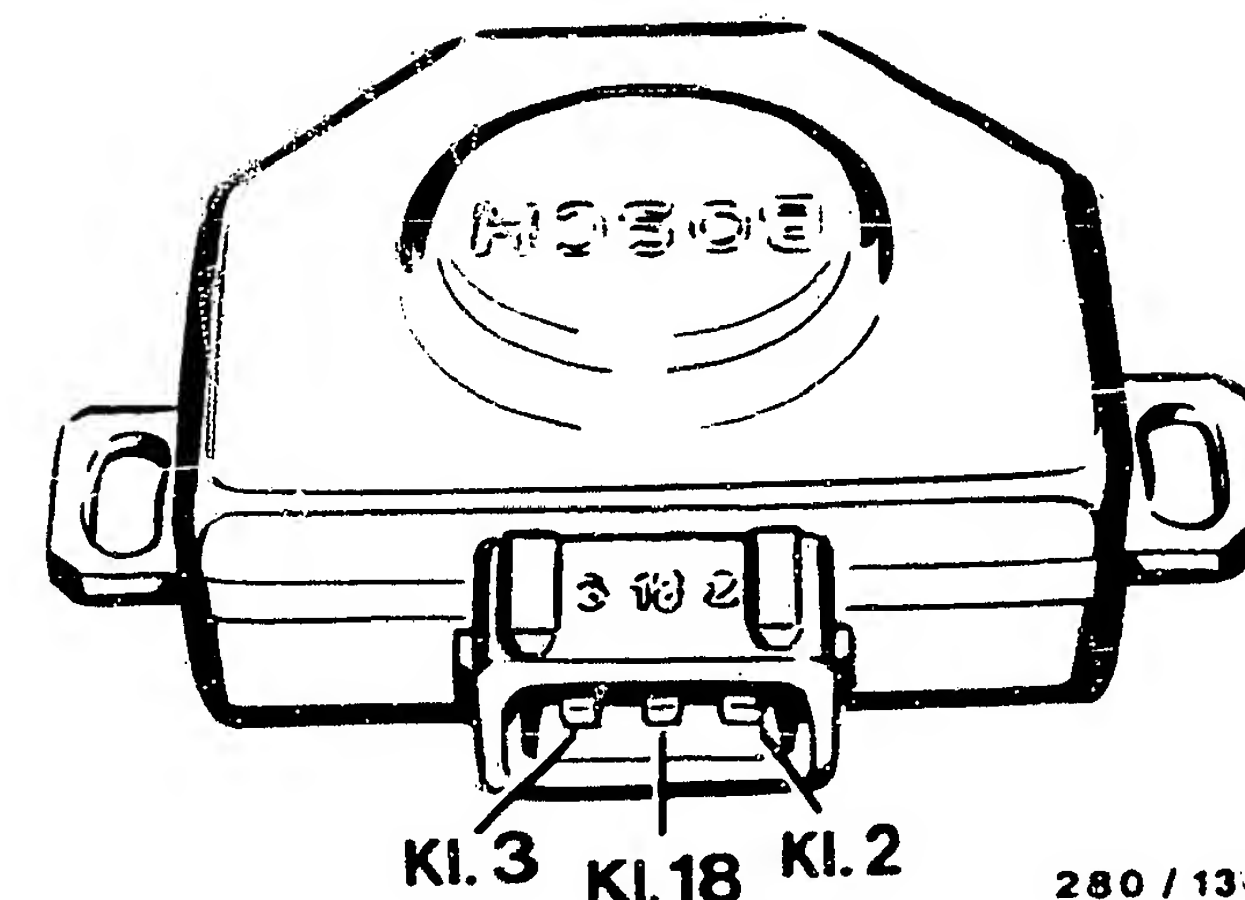
Set value: approx. 0 Ω

Check plug for corrosion and loose contact.
Contacts must now allow themselves to be pushed back.

Set value obtained?
Contacts O.K.?

N>

Repair defective lead/plug.



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (12)

V

Check air-intake system

Check whether hoses of air-intake system are correctly connected, not kinked or damaged.

Check whether oil dipstick has been inserted as far as it will go and whether the seal on the oil filler-neck cap is O.K.

With catalytic-converter models, check also that the tank-ventilation system (if applicable) is not leaking (visual examination).

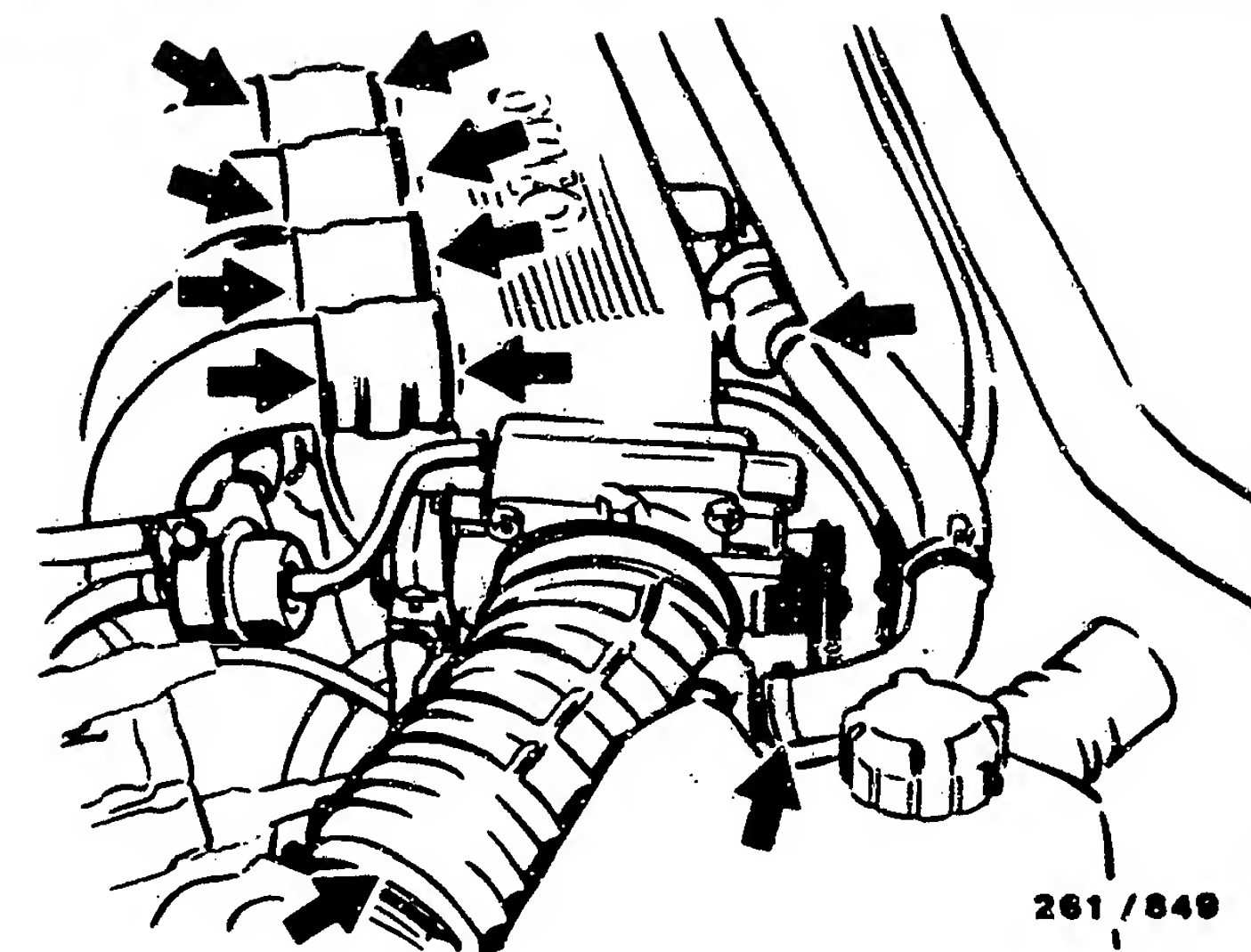
Are all hoses O.K.?

N>

Replace hoses if necessary. Eliminate leaks by means of new seals or by retightening the hose clamps.

Y

Continued on next picture page



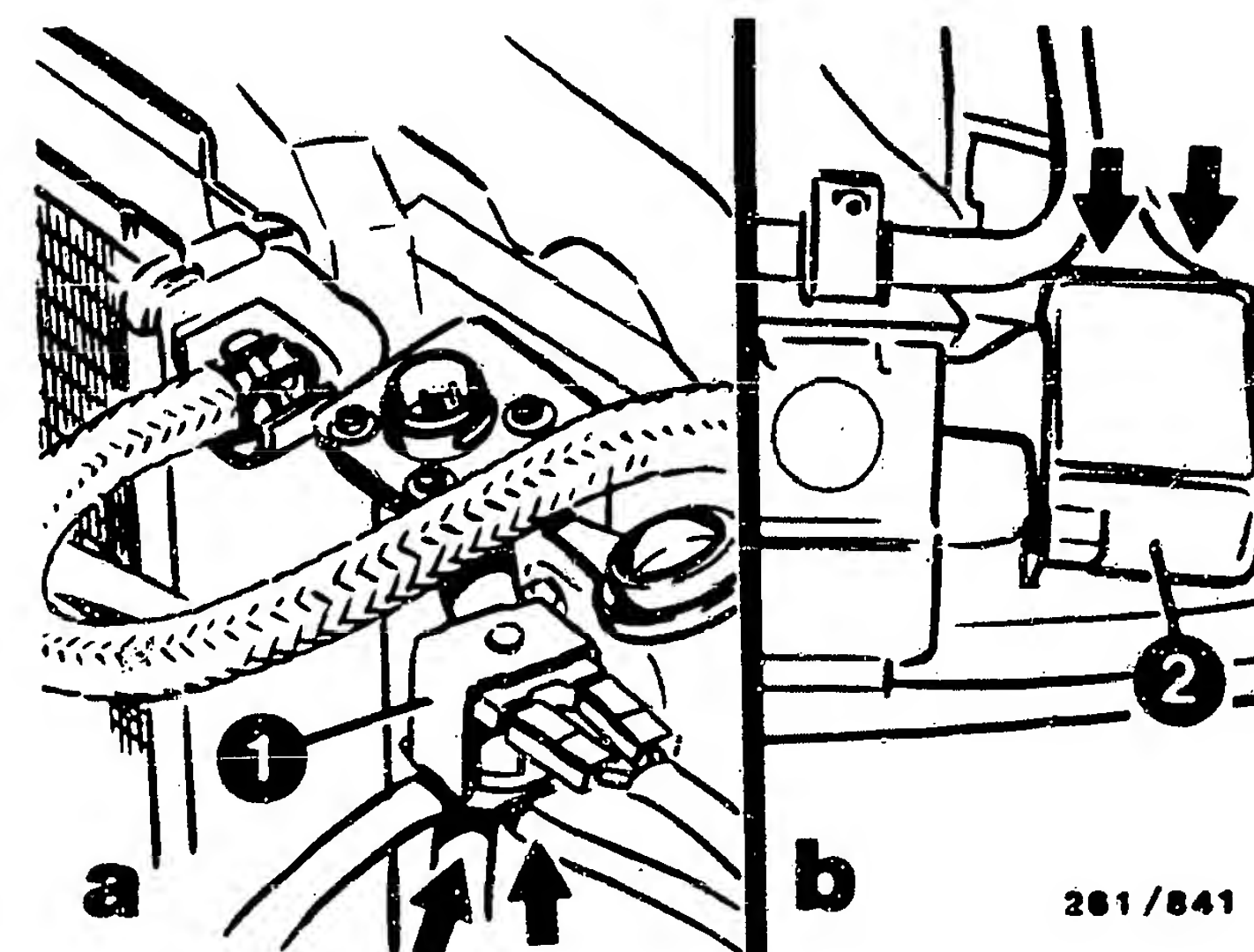
Arrow = Sealing points of air-intake system

Alfa 75 Twin Spark S:

1 = Tank-ventilation switching valve (not from Bosch)

2 = Active-carbon container (beneath vehicle, in front of right-hand, front wheel house)

Arrows = Bleeder hoses



TRUBLE-SHOOTING PROGRAM (12) CONTINUED (1)

Leak test on air-intake system.

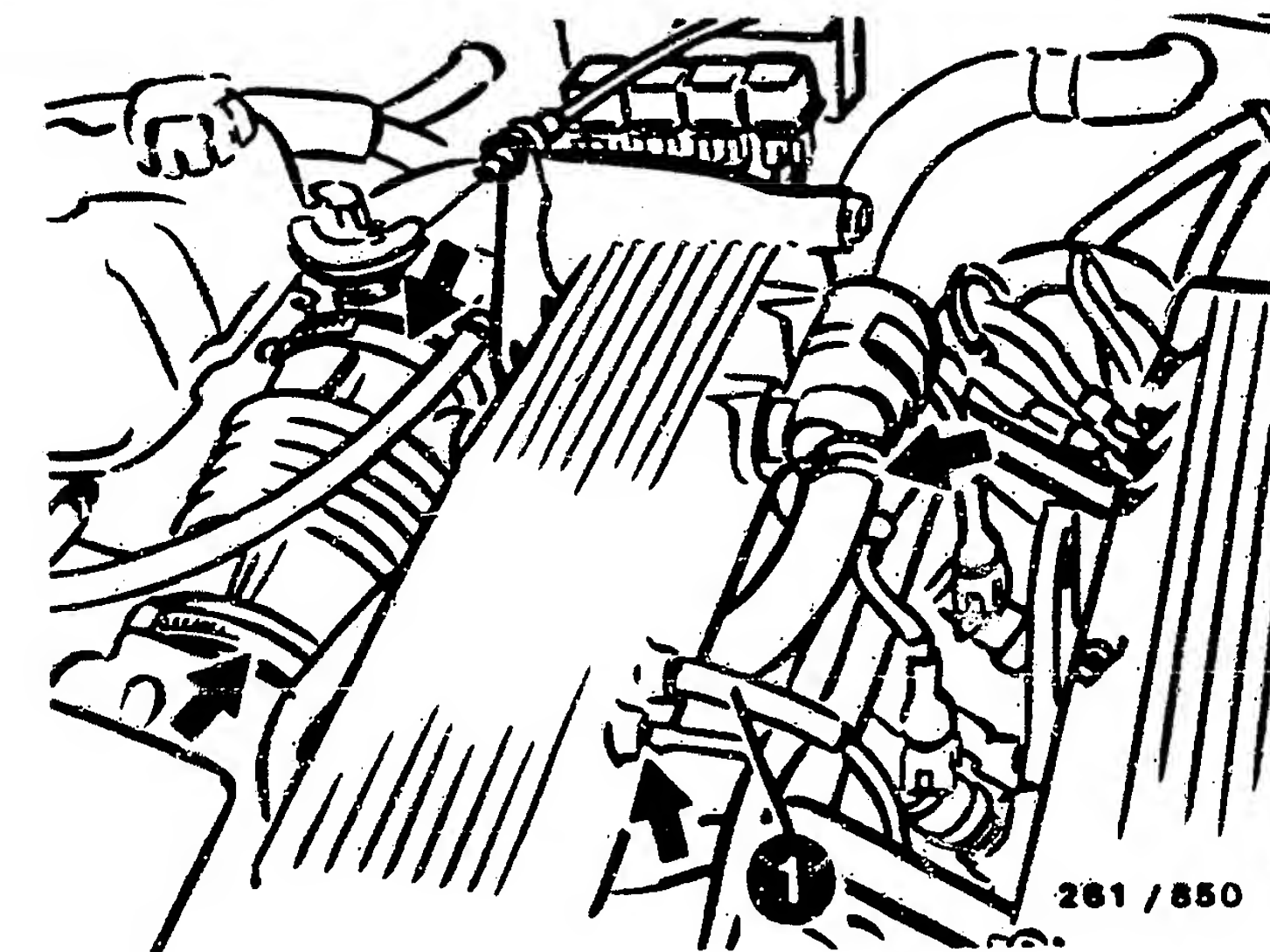
Seal off exhaust tail pipe. Unscrew air-flow sensor from air-filter housing and seal off air-flow sensor duct. Disconnect hose after idle actuator. Seal off idle-actuator connection. Fully open throttle valve. Using a compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Using a leak-detector spray or soapy water, spray or brush all joints. Bubbling or foaming indicates a leak.

Are all joints tight?

N>

Eliminate leaks by means of new seals or by retightening the hose clamps.

Leaks may also occur at the following points: oil dipstick not securely inserted, defective seal at oil filler-neck cap etc.



Alfa 75 Twin Spark S:

1 = Bleeder hose from tank-ventilation switching valve

Arrows = Sealing points in air intake system

Return to trouble-shooting chart B03

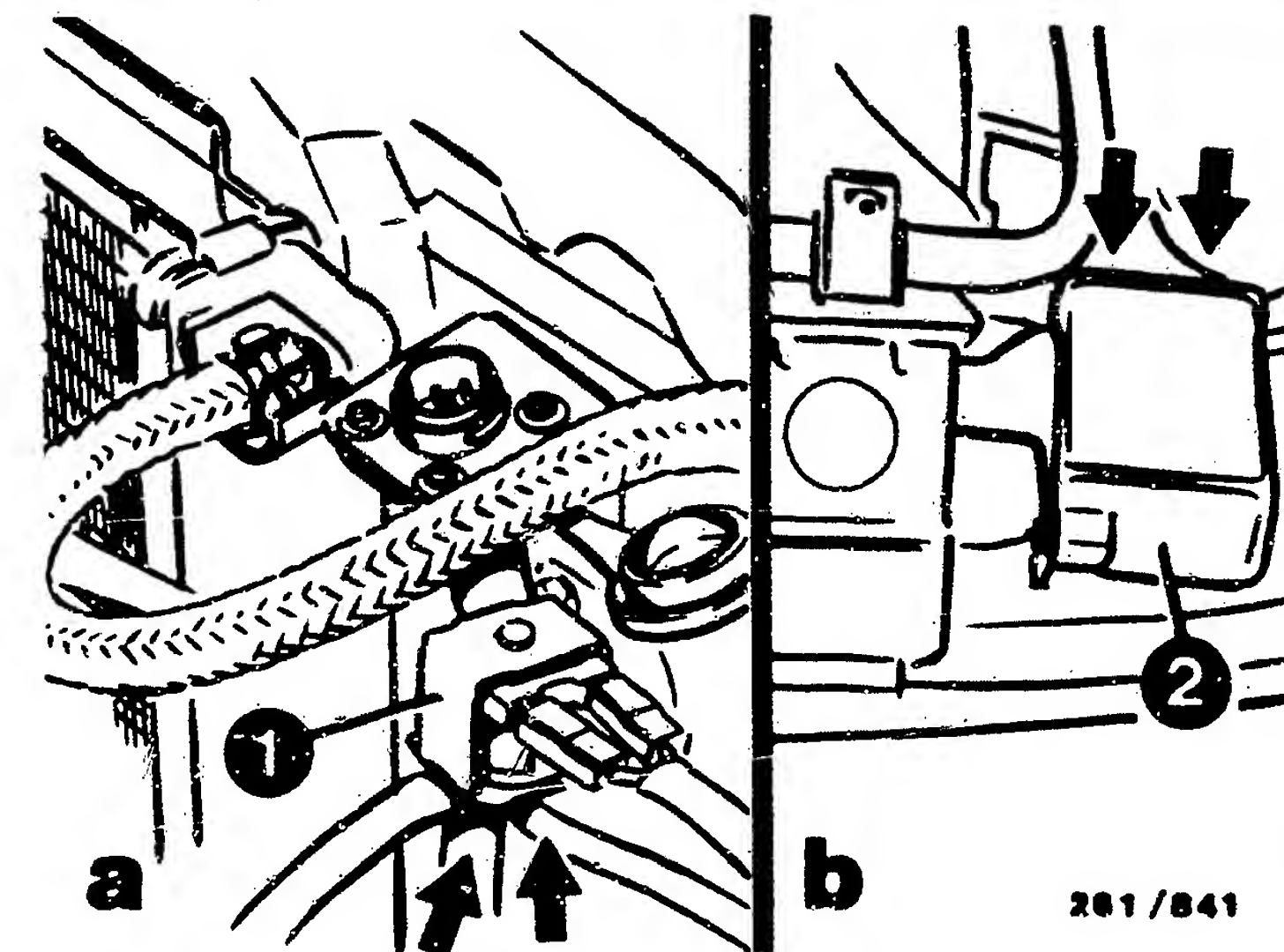
TROUBLE-SHOOTING PROGRAM (13)

Check tank-ventilation system.

Check visually whether hoses of tank-ventilation system are correctly attached, not bent or damaged.
Check whether hose connections at intake manifold, tank bleeder valve, active-carbon canister and fuel tank are leak-tight.

Are all hoses and connections O.K.?

Replace defective hoses as necessary.
Eliminate leakages by tightening hose clamps.



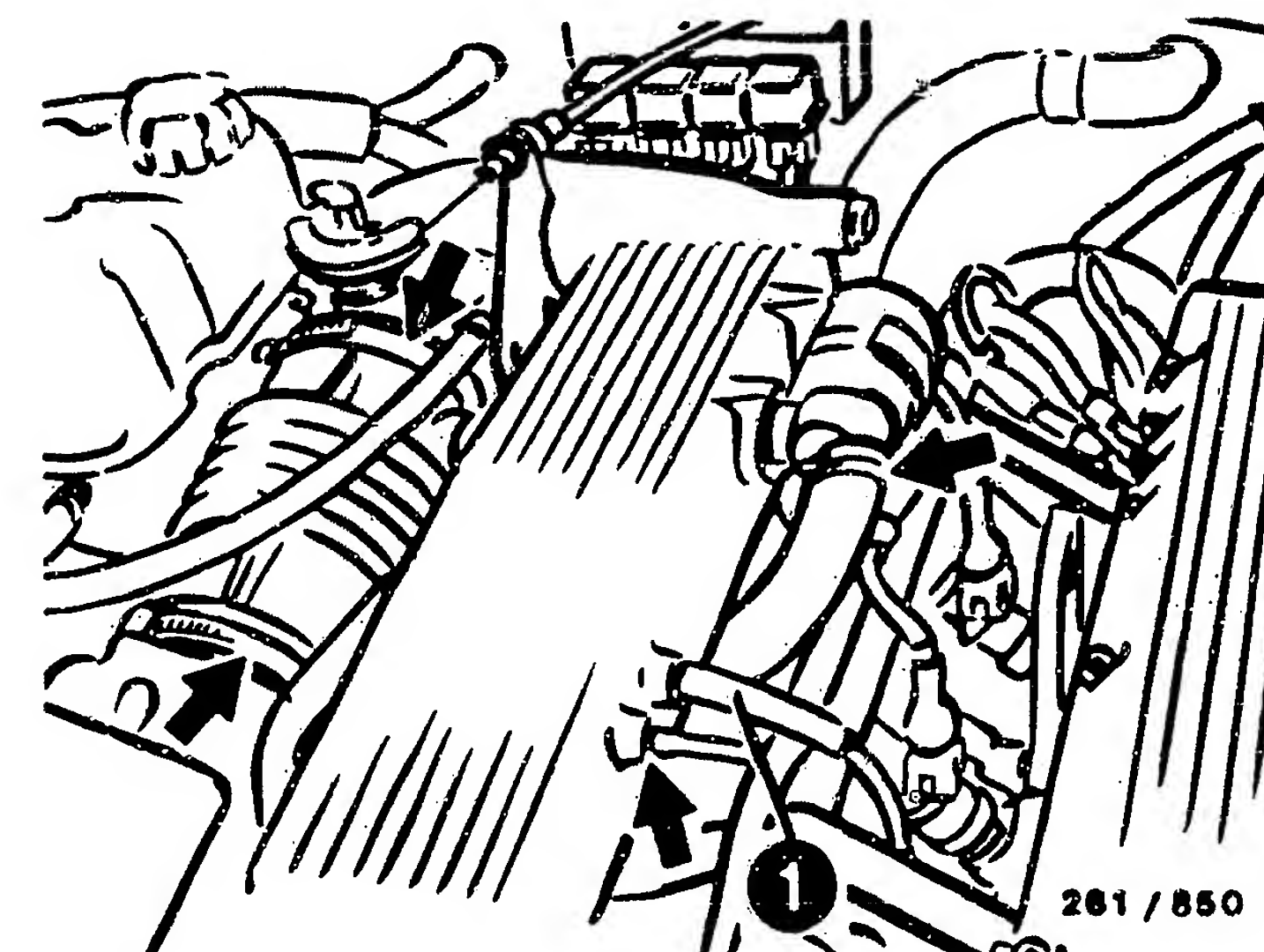
Alfa 75 Twin Spark S:

- 1 = Tank-ventilation switching valve (not from Bosch)
- 2 = Active-carbon container (beneath vehicle, in front of right-hand, front wheel house)

Arrows = Bleeder hoses

Alfa 75 Twin Spark S

- 1 = Bleeder hose of tank-ventilation switching valve



Continued on next picture page

TROUBLE-SHOOTING PROGRAM (13) CONTINUED (1)

V

Test tank-ventilation switching valve (TES) for leaks.

N>

Renew tank-ventilation switching valve.

Detach electrical connections and bleeder hoses at TES.

Connect vacuum pump (e.g. Mityvac) to intake-manifold-end connection of valve.

1. Valve deenergized:

No continuity, i.e. vacuum can build up

2. Actuate valve with battery voltage (12 V):

Continuity, i.e. no vacuum build-up possible.

TES O.K. ?

Y

Return to trouble-shooting chart B03

F17

<=>

F18

<=>

TROUBLE-SHOOTING PROGRAM (14)

Check ignition coil.

Visual check:

Remove hood from ignition coil and check that plug (top picture) is in position and that no sealing compound has escaped.

Electrical test:

Measure resistance of ignition coil on primary side (term.15 and term.1; take resistance of test lead and test prods into account) and on secondary side (term.1 and term.4):

SET VALUES:
see brief instructions

Plug in position and no sealing compound escaped?

Resistance values O.K.?

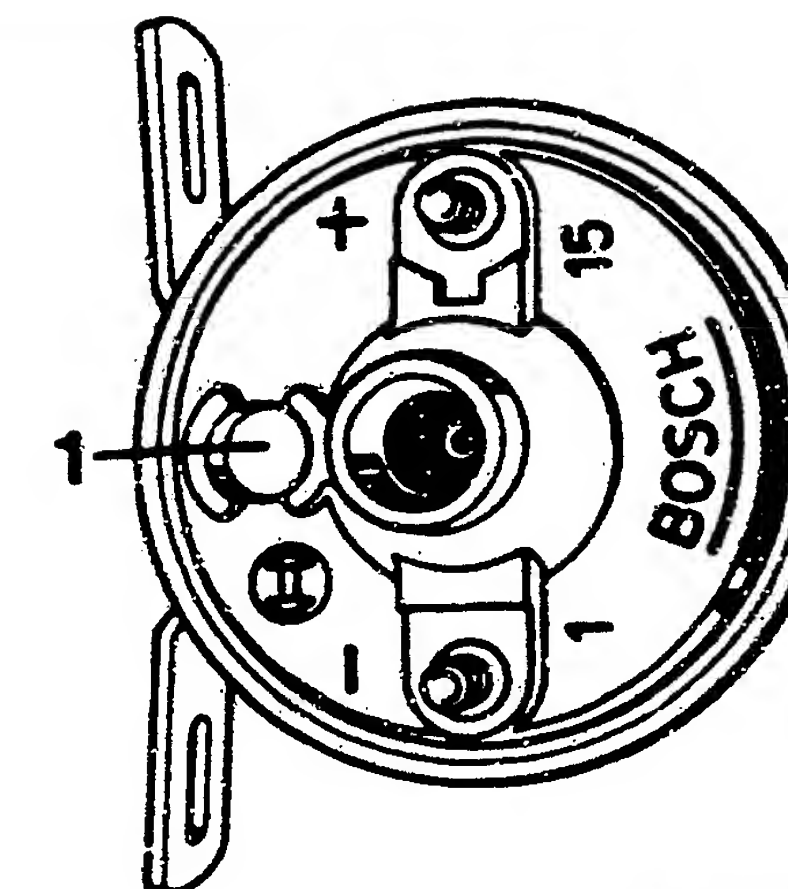
N>

1. No plug or sealing compound oozed out:

Renew ignition coil and control unit.

Check lead from ignition coil, term. 1 to control unit, term. 1 for short-circuit to ground and continuity.

2. Resistance values not within tolerance:
Renew ignition coil.



227/0059

1 = Plug

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (15)

Check primary signal with
oscilloscope:

Connect oscilloscope to ignition
coil.

Connect Motronic control
unit.

Disengage gear and start
engine.

SET VALUE:

Primary signal must be
present (see top picture).

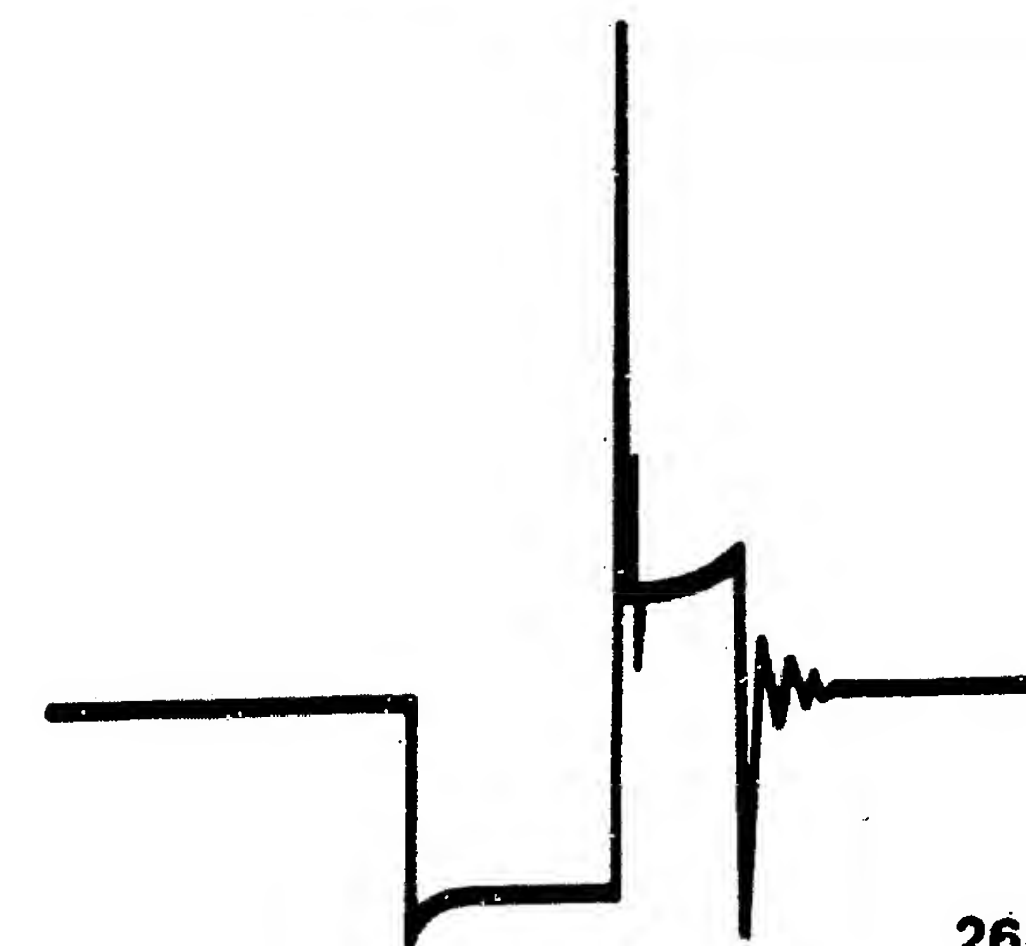
Primary signal present?

N>

+ Check lead from ignition
coil term.1 to control
unit term.1 for continuity.

+ If lead O.K., replace
control unit.

Requirement: voltage supply
for control unit available
and engine-speed/
reference-mark signal
O.K. and ignition coil
checked.



Primary signal

261 / 0212

Continued on next picture page

Check secondary patterns of all cylinders and interference-suppression resistors.

SET VALUES for interference-suppression resistors;
see brief instructions

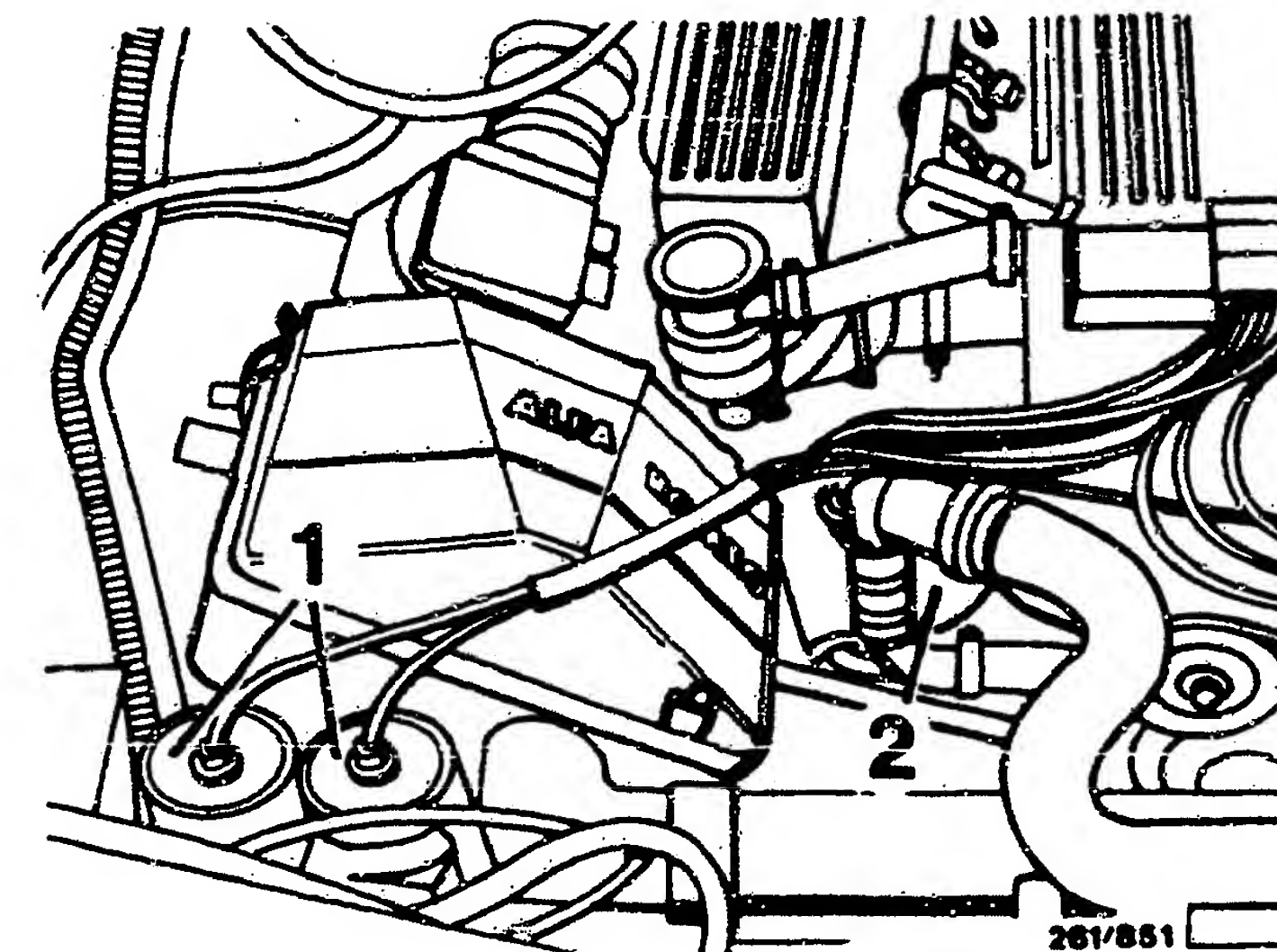
Secondary patterns and interference-suppression resistors O.K.?

N>

*Outside and/or inside of distributor cap oil fouled?
Scorch marks visible?

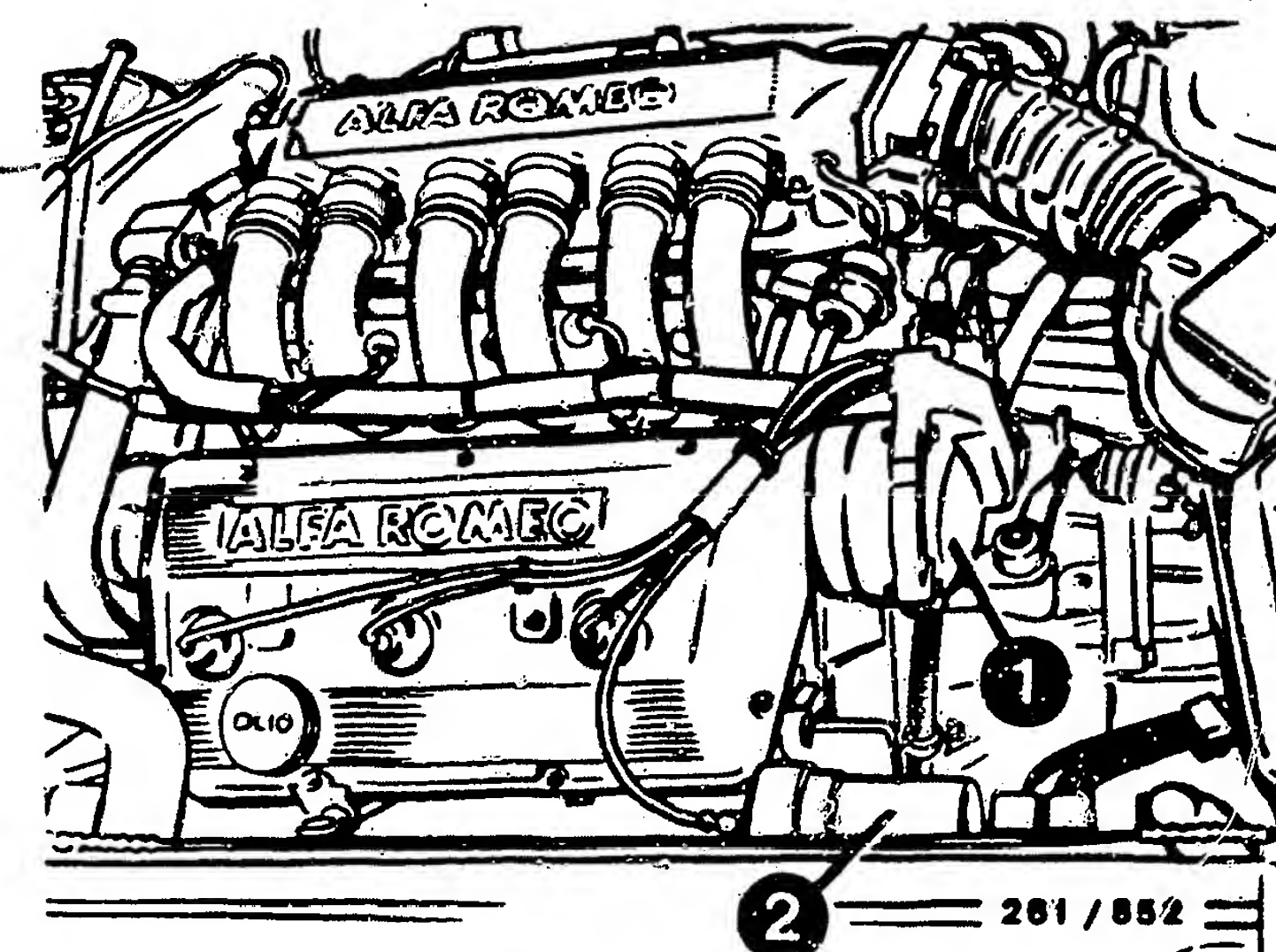
*Check interference-suppression resistors, ignition cables and spark plugs.

*When plugging on the ignition cables, note the cylinder numbers.
Do not forget hood and screening cover.



Alfa 75 Twin Spark S:
1 = Ignition coils (2 x)
2 = Ignition distributors (2 x)

Alfa 164 3.0 V6:
1 = High-tension distributor
2 = Ignition coil



Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (16)

V

* Check overrun cutoff:

N>

Connect the two-pole test lead 1 684 463 093 between an injection valve and its connector.

Connect motortester (special input) to test lead. Black clamp to vehicle ground. Connect red clamp to one of the two connections of the test lead.

Caution: The free connection clamp of the test lead must not come into contact with ground.

Raise engine speed to 3000 min⁻¹. Injection signals visible (see top picture). Suddenly release accelerator.

SET VALUE:

With falling engine speed, injection signals are suppressed and are reinstated above the idle speed.

Set value O.K.?

Y

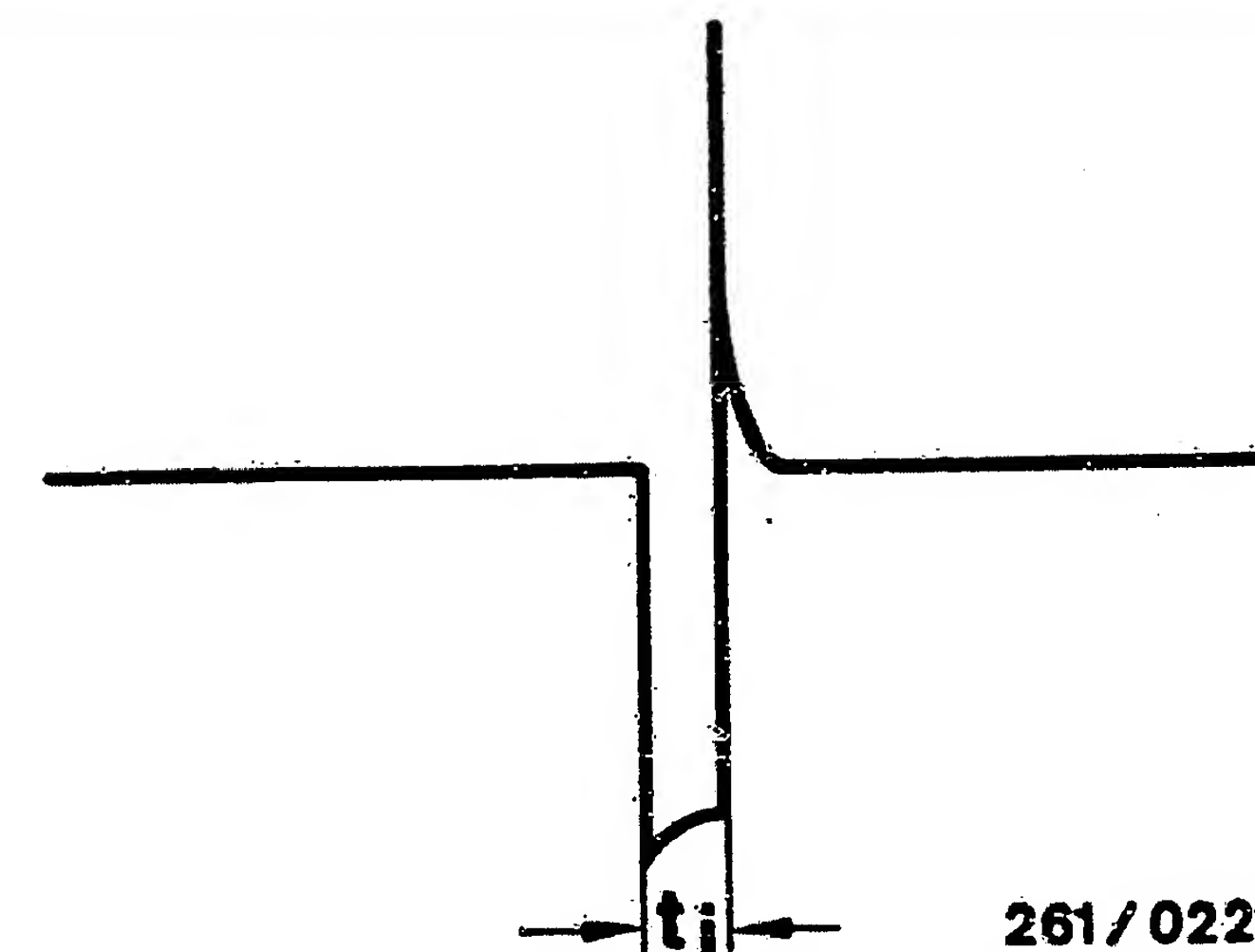
V

Return to trouble-shooting chart B03

* Repeat test.

* Check idle contact in throttle-valve switch.

* Control unit defective.



261/0221

Injection signal
t_i = Duration of injection

TROUBLE-SHOOTING PROGRAM (17)

* Check idle speed:

Connect motortester according to operating instructions.
Engine at operating temperature, switch off electrical equipment. Set automatic transmission to N or P.

SET VALUE: See brief instructions

Set value obtained?

N>

* Idle contact in throttle-valve switch must be closed -> check.

* Check idle actuator.

* There is no idle-adjusting screw.

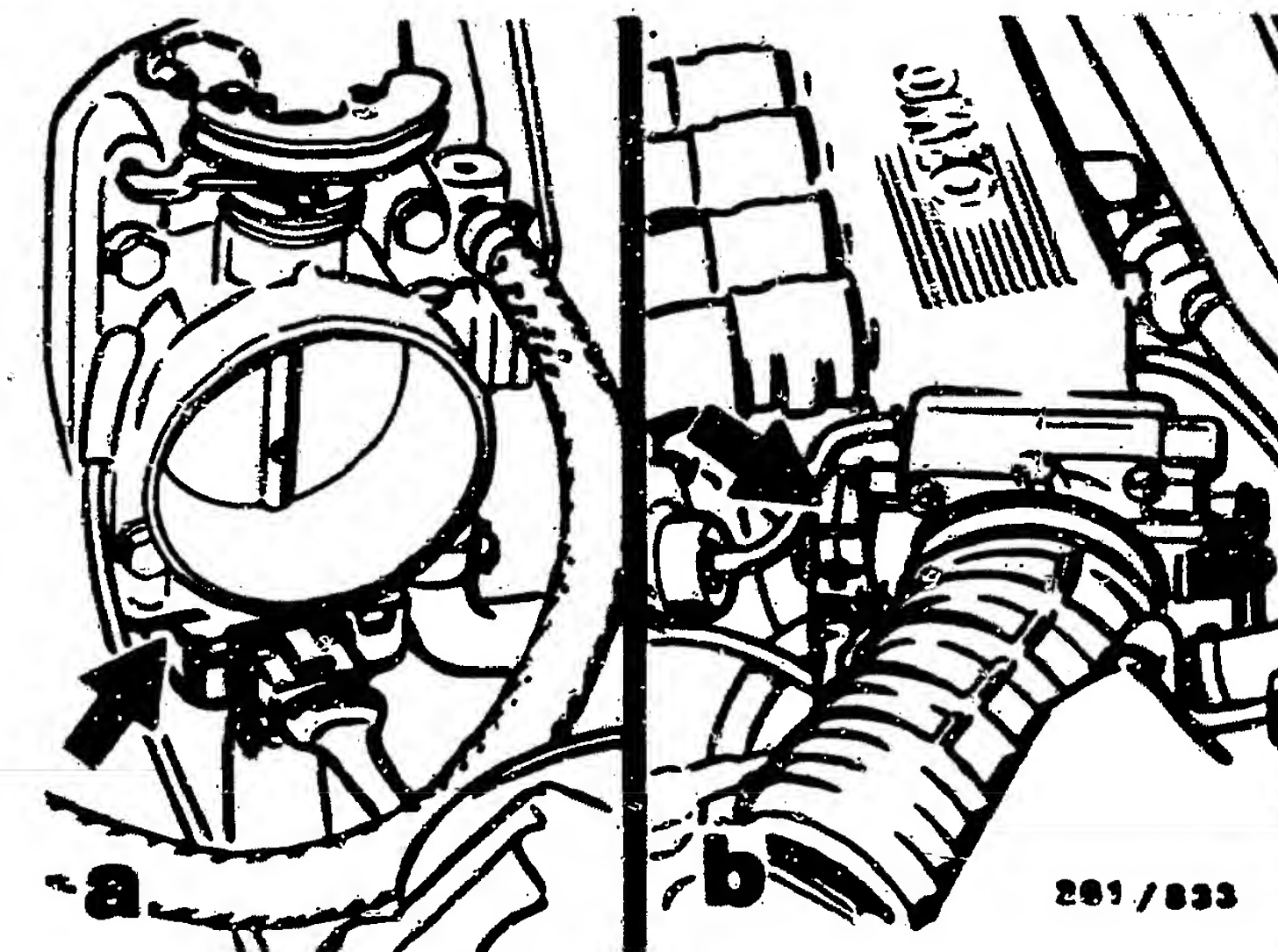
* See trouble-shooting chart for further possibilities.

Return to trouble-shooting chart
B03

F27



F28



Picture a: Alfa 75 Twin Spark S

Picture b: Alfa 164 3.0 V6

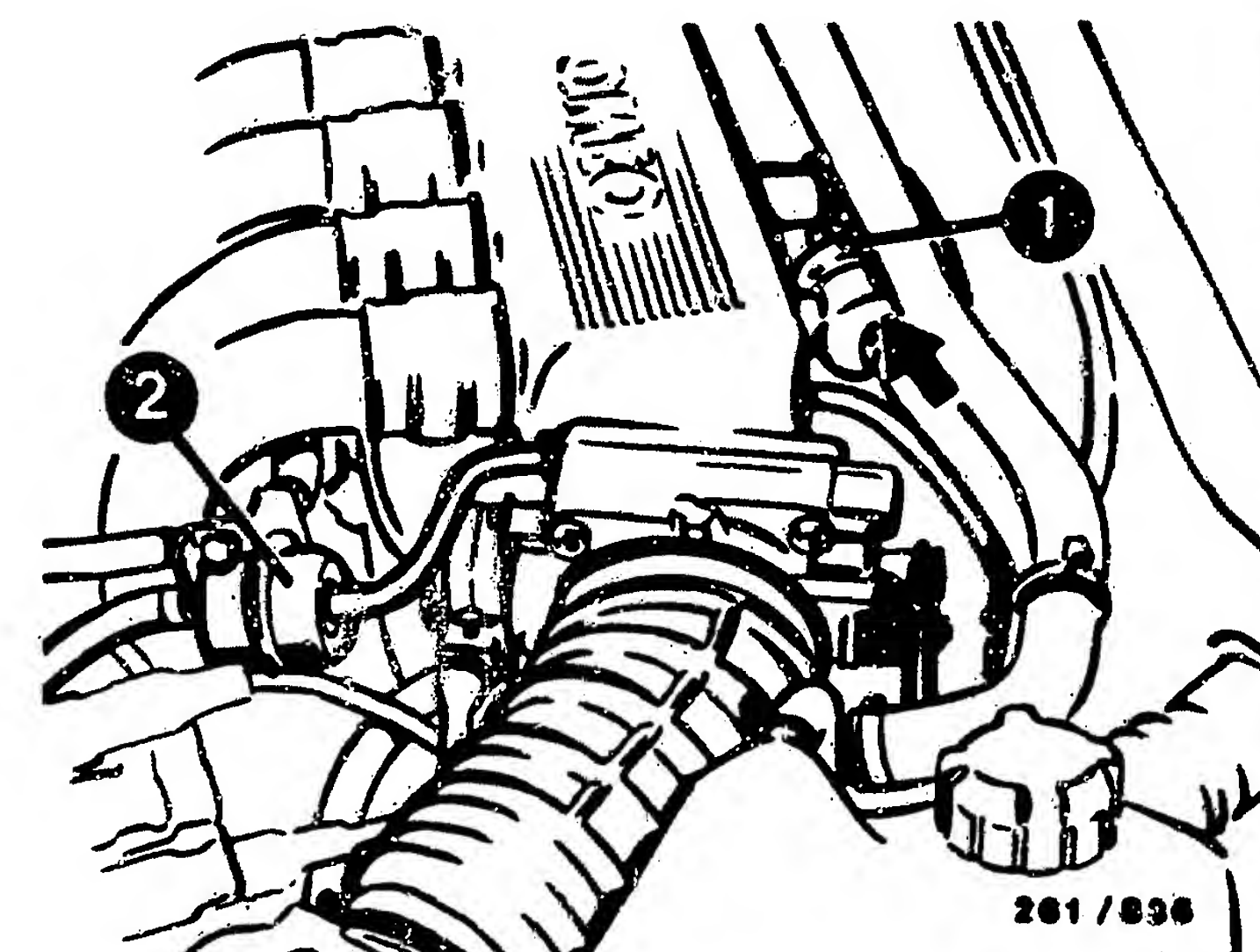
Arrows = Throttle-valve switches

Alfa 164 3.0 V6:

1 = Idle actuator

2 = Fuel pressure regulator

Arrow = Direction of flow



TROUBLE-SHOOTING PROGRAM (8)

Test ignition angle:

Connect Motortester.

Bring engine up to operating temperature (engine oil temperature in excess of 60° C).
Switch off all electrical loads.

For measuring ignition angle, use TDC sensor or flash ignition mark with a lamp.

Idle speed must have prescribed set value (see brief instructions) and idle contact must be closed, otherwise a different ignition angle is indicated.

SET VALUE for ignition angle:
See brief instructions

Is set value attained?

N>

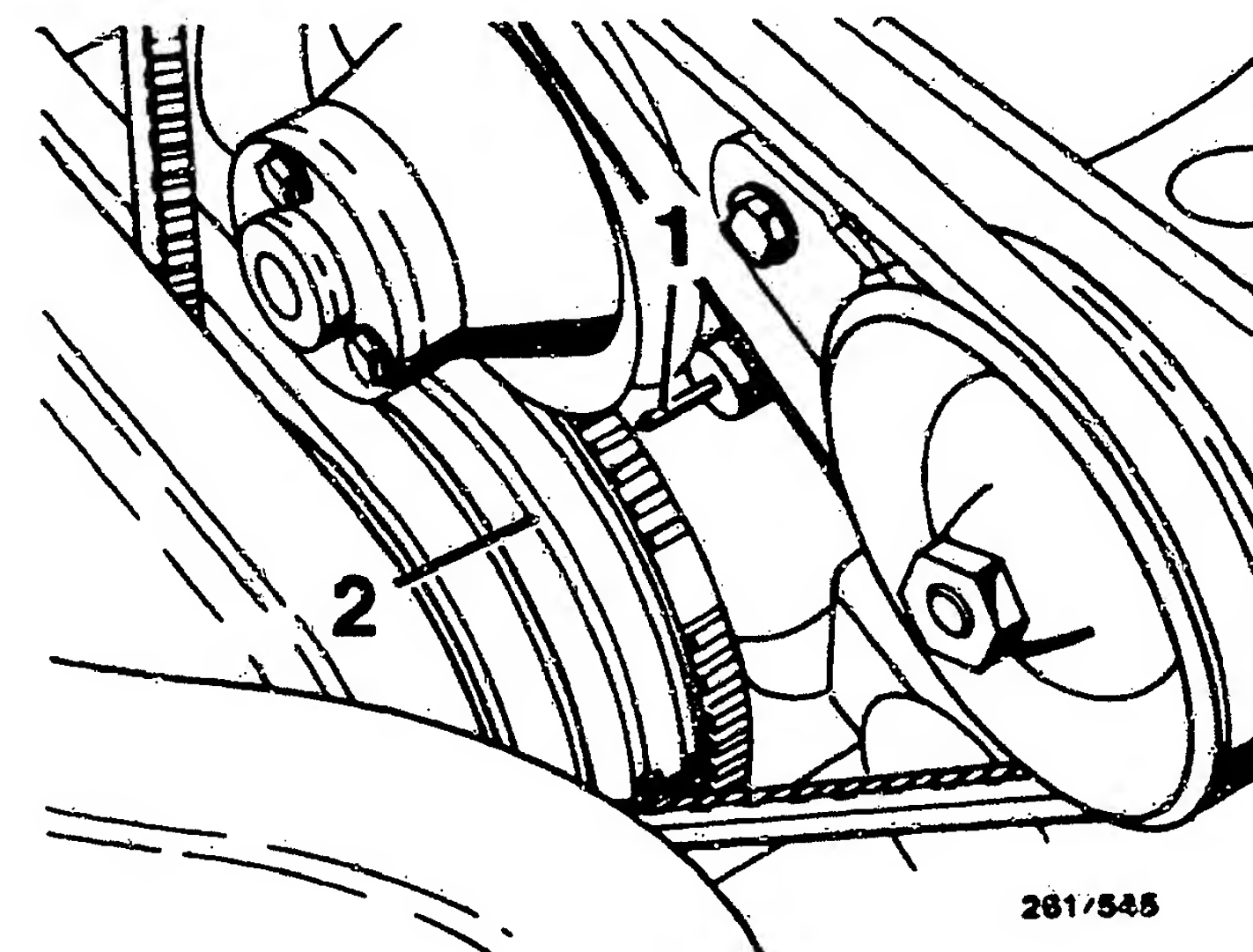
+ Idle speed correct?
+ Control unit defective.

Return to trouble-shooting chart
B03

G01



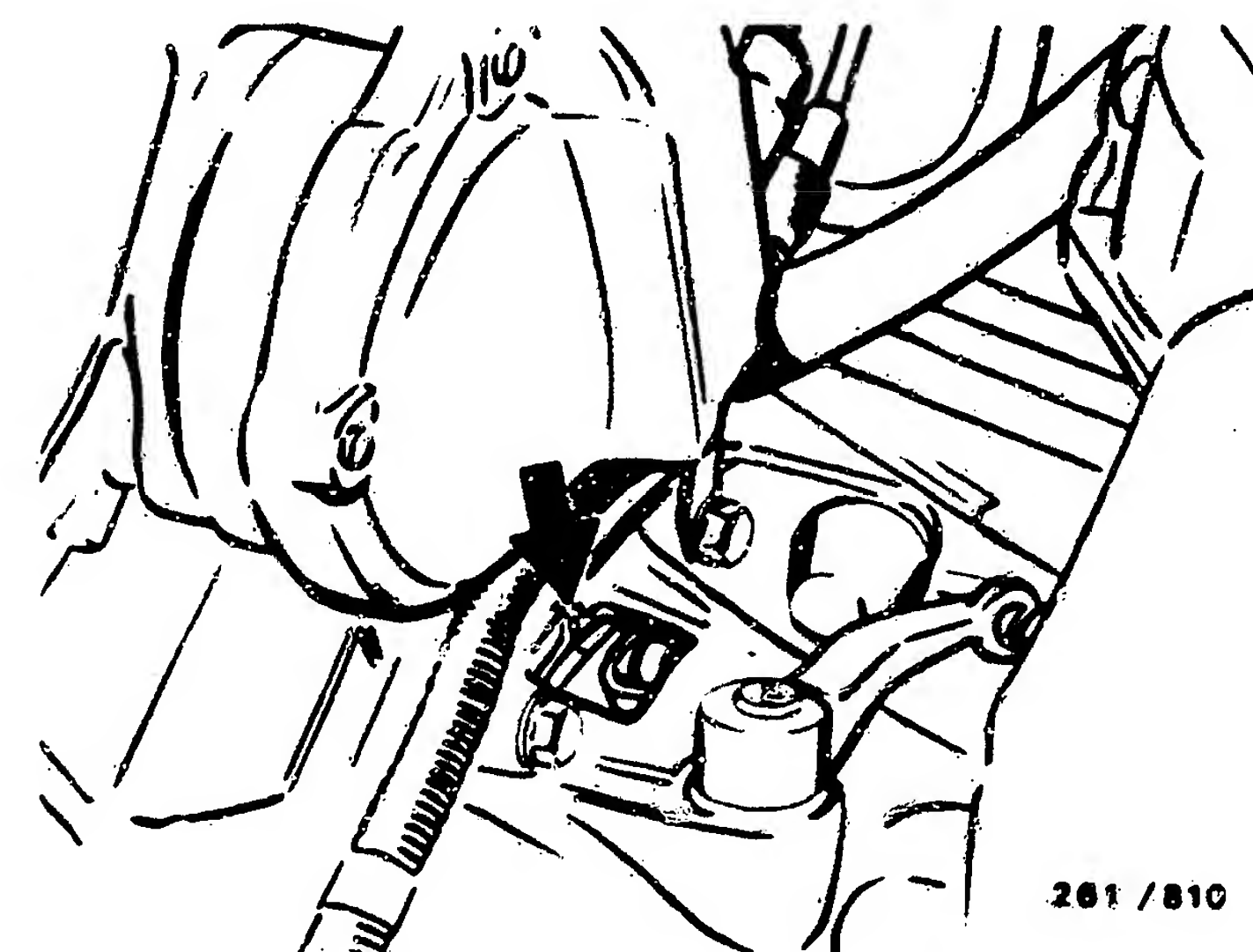
G02



261/545

Alfa 75 Twin Spark S:
1 = Fixed pin
2 = V-belt pulley with
moving ignition mark

Alfa 164 3.0 V6:
Arrow = TDC mark (remove rubber
cap)



261/810

TROUBLE-SHOOTING PROGRAM (19)

Test exhaust gas (CO):

Measurement conditions:

Engine at operating temperature,
electrical loads switched off,
prescribed idle speed (idle contact
closed), seal crankcase breather
hose, set automatic transmission to
N/P.

1. Vehicles with no catalytic
converter:

Connect exhaust-gas analyzer to
tailpipe and determine CO.

SET VALUE:

See brief instructions.

2. Vehicles with catalytic converter:

Measure CO ahead of catalytic
converter (if sampling point
provided) and at tailpipe.

The CO content downstream of the
catalytic converter must be con-
siderably less than ahead of it;
otherwise the catalytic converter
is defective.

Generally, values about 0 vol.%
CO are measured at the tailpipe.

SET VALUES: See brief instructions

Note:

Monitoring and basic setting of
the mixture are effected by the
adaptive lambda closed-loop
control (via lambda sensor);
there is therefore no need for
any adjustment.

Set values O.K.?

N>

1. Vehicles with no catalytic
converter:

Mixture (CO) can be adjusted at
potentiometer in air-flow sensor
(top picture):

Remove plug in air-flow sensor.

Turn potentiometer in a clockwise
direction; CO increases (duration
of injection becomes longer).

Turn potentiometer in a counter-
clockwise direction, CO decreases
(duration of injection becomes
shorter).

Note:

Adjustment range of duration of
injection is max. 0.6 ms.

Following adjustment, fit new
plug (diameter 13 mm, part no.
1 280 508 010).

2. Vehicles with catalytic converter:

Test air-intake and exhaust
system (particularly ahead of
lambda sensor) for leaks.

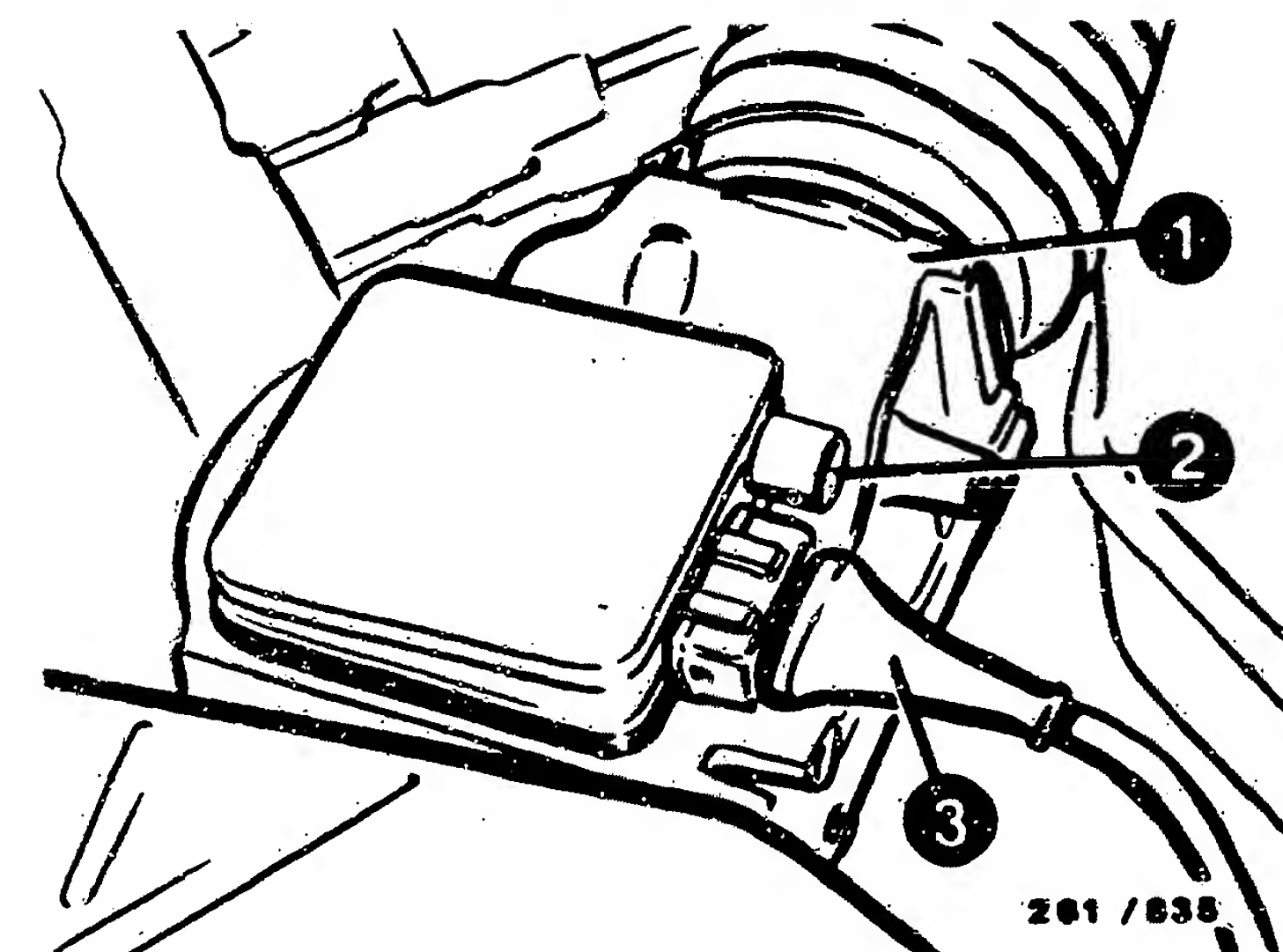
Lambda sensor defective.

Control unit defective.

If CO too high downstream of
catalytic converter:

Catalytic converter O.K.?

Refer to trouble-shooting chart for
further possible faults.



1 = Air-flow sensor

2 = CO potentiometer

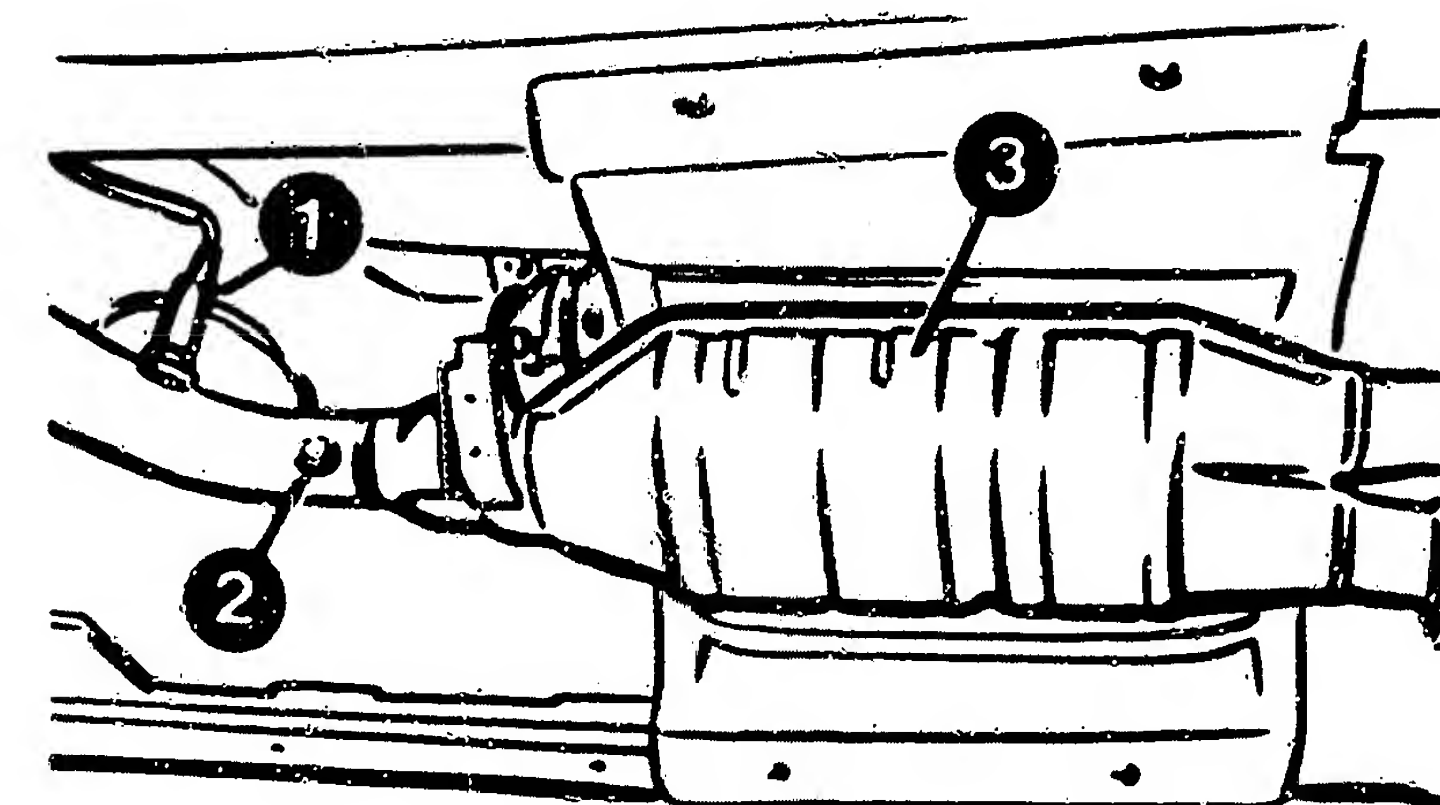
3 = Plug of air-flow sensor

Alfa 75 Twin Spark S

1 = Lambda sensor

2 = CO sampling point ahead of
catalytic converter

3 = Catalytic converter



Return to trouble-shooting chart
B03

PARTS SET FOR SOLENOID-OPERATED

INJECTION VALVES 0 280 150 2..

AND PRESSURE REGULATORS 0 280 160 2..

13...39

VDT-I-261/102 En

6.1983

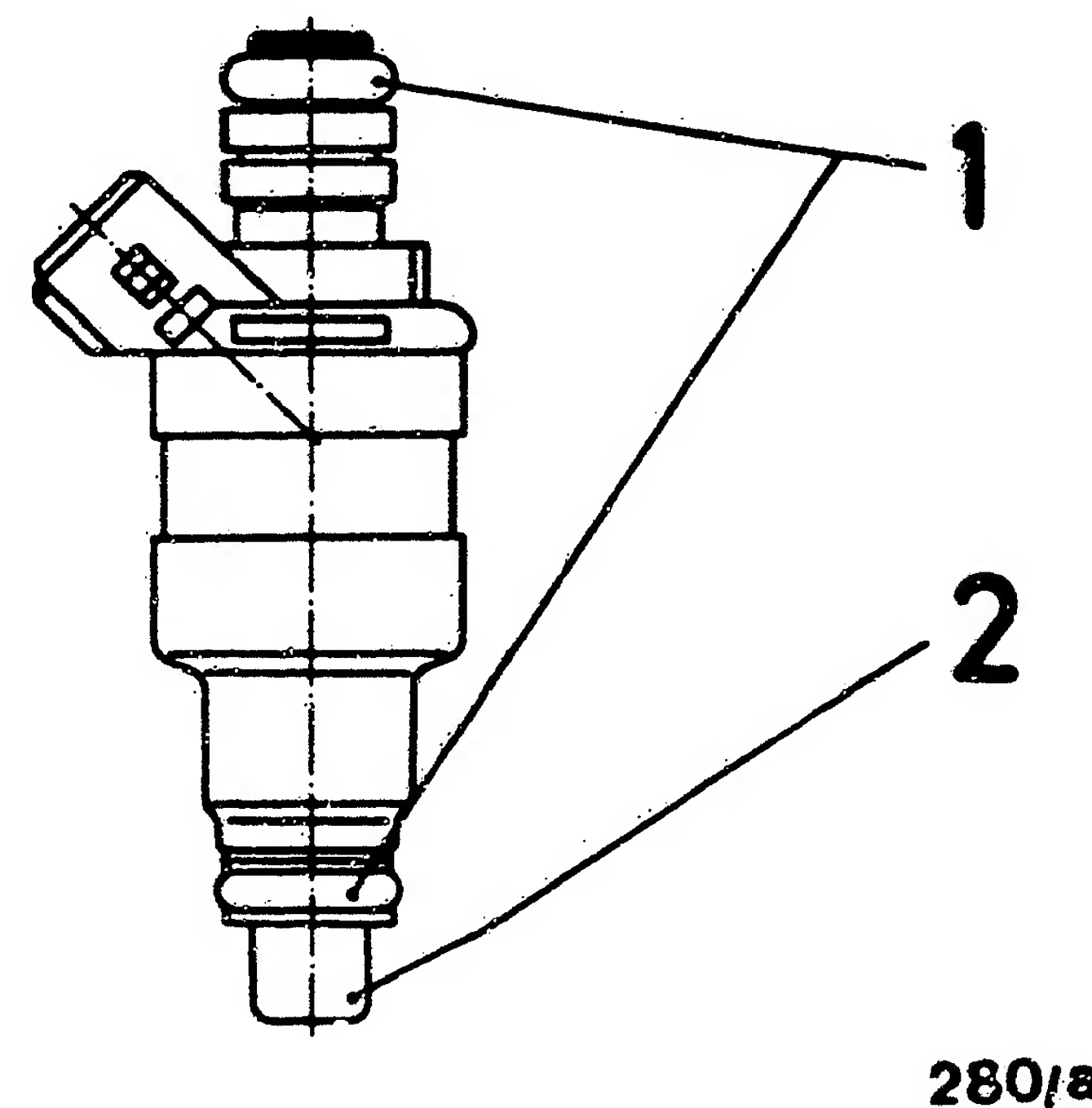
supersedes 8.82 edition

A common parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and is listed in the service-parts microcard under solenoid-operated injection valves (see EE 00 under 0 280..).



1 = O-ring

2 = Protection sleeve

Contents for 1 injection valve:

2 x O-ring

1 x Protection sleeve, yellow

Contents for pressure regulator:

1 x O-ring

1 x Supporting plate

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Division KH

Technical After-Sales Service (KH/VKD 2)

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PLUG CONNECTORS FOR JETRONIC COMPONENTS

28
VDT-I-280/111 En
11.1984

Parts sets supersedes Ed. 11.1982

Parts sets are available for the replacement
of Jetronic plug connectors, comprising:

- * Plug-connector housing
- * Protective cap (rubber sleeve)
- * Contact springs

These parts are listed on microcard EE...*

- * See microcards EE00 and 0 280 ..

- * Plug, black, 2-pole,
parts set 1 287 013 002 cable connector
in conjunction with socket, 2-pole.

- * Socket, black, 2-pole,
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- * Socket, gray, 2-pole,
parts set 1 287 013 003 for:

Injection valve 0 280 156 ..

- * Socket, black, 3-pole
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- * Socket, black, 5-pole,
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. .. (LE version)

- * Socket, black, 6-pole,
parts set 1 287 013 004 for

Air-flow sensor 0 280 200 ..

- * Socket, black, 7-pole,
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..

Air-mass sensor 0 280 211 ..

- * Wiring-harness plug connector, black, 25-pole,
parts set 1 287 013 009 for:

Control unit 0 280 0..

- * Wiring-harness plug connector, black, 35-pole,
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also
available individually under part number
1 284 477 026.

The plug-connector housings are available
only in the stated colors.

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INDEX

Term	Coordinate
Activation of self-diagnosis	E09
Adjustment of CO content	G03
Air intake system	F11
Air-flow sensor (electrical testing)	E27
Air-flow sensor (mechanical testing)	E25
Camshaft switching	D09
Control unit	D11
Diagram of air lines	—
Diagram of fuel lines	E17
Electric fuel pump	E23
Engine-speed/reference-mark sensor	E03
Exhaust gas	G03
Fuel (leak test)	E17
Fuel delivery	E23
Fuel filter	E23
Fuel pressure	E13
Fuel pump relay	D05/E13
Fuel-injection signal	D21
Full-load contact	B27
Full-load enrichment	—
Ground connection	D15
High-tension distributor	F23
How to use microcard	A01
How to use self-diagnosis	B05
How to use trouble-shooting chart	B01
How to use trouble-shooting program	B01
Idle adjuster	C19/D23
Idle contact	B23/F05
Idle speed	F27
Ignition angle	G01
Ignition coil	F19
Ignition signal	F21/F23
Installation position of components	A13/A15/A17
Interference	D21

INDEX

Term	Coordinate
Lambda sensor	C25
Leak test	F13
Main relay	B19/D17
Motronic relay	—
Overrun cutoff	F25
Pre-supply pump	E23
Precautionary measures	A09
Pressure regulator	E13
Pump noise	E23
Relief relay	B19
Safety measures	A09
Self-diagnosis	B07
Self-diagnosis test table	B13
Self-diagnosis trouble-shooting program	B19
Solenoid-operated injection valve	D21
Special features	A03
Tank ventilation valve	E01/F17
Temperature sensor (engine)	C03
Temperature sensor (intake air)	D03
Testers	A11
Throttle-valve adjustment	F05
Throttle-valve switch (full load)	F09
Throttle-valve switch (idle)	F05
Tools	A11
Trouble-shooting chart	B03
Trouble-shooting program	D15
Variant encoding	A05
Voltage supply	D15

TABLE OF CONTENTS

Section	Coordinates
Structure of this microcard	A01
How to use this microcard	A02
Special features	A03
Safety and precautionary measures	A09
Testers and tools	A11
Installation position of components	A13
How to use trouble-shooting chart and trouble-shooting program	B01
Trouble-shooting chart	B03
How to use self-diagnosis, self-diagnosis test table and trouble-shooting program	B05
Self-diagnosis	B07
Self-diagnosis test table	B13
Self-diagnosis trouble-shooting program	B19
Trouble-shooting program	D15
Technical bulletins	N01
Index	N25

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